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JPRS 84521

12 October 1983

19981013 095

China Report

SCIENCE AND TECHNOLOGY

No. 209

CHINA ADDRESSES ENVIRONMENTAL

ISSUES -- 1/83

DTIC QUALITY INSPECTED 4

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Material of the type in this issue formerly appeared in WORLDWIDE REPORT ENVIRONMENTAL QUALITY, which has been discontinued. The previous five issues on China Environmental Issues were published under JPRS 81037, JPRS 81737, JPRS 82241, JPRS 83010, JPRS 83766. This material will now be found under the CHINA REPORT SCIENCE AND TECHNOLOGY series.

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CHINA REPORT

SCIENCE AND TECHNOLOGY

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QUADRUPLING OUTPUT AND THE ROLE OF ENVIRONMENTAL PROTECTION

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 4, 1983 pp 5-8

[Article by Guo Zuyuan [6665 4371 3293]: "Implement the Spirit of the 12th Party Congress; Create New Prospects for Urban and Rural Environmental Construction"]

[Text] The nation's basic mission is to concentrate our forces to carry out socialist modernization construction. Economic construction is the heart of all modernization construction. Each trade and industry should obey and serve economic construction. Urban and rural environmental construction must develop in coordination with, and at the same pace as, economic construction. Under the direction of the spirit of the 12th party congress, we should strive to create new prospects for urban and rural environmental construction.

I. Make explicit the guiding ideology for creating new prospects for urban and rural environmental construction.

In guiding ideology to create new prospects for urban and rural environmental construction, I think we should conscientiously carry out the spirit of the 12th Party Congress and the three policies of economic construction, urban and rural construction, and environmental protection, uphold the principles of the four professional ethical viewpoints of urban and rural construction and environmental protection and closely coordinate with economic construction and actively serve the four modernizations.

In the spirit of the 12th Party Congress, to ensure quadrupling production with constant improvement in economic results, it is necessary to adopt the two phase strategic plan of laying a good foundation in the first 10 years and accelerating the pace in the latter 10 years. Thus, in accordance with the 10 policies of economic construction, the 16 character policy of urban and rural construction, and the 32 character policy of environmental protection, we should cooperate and work actively then during the Sixth Five-Year Plan we can complete the 10 basic missions set forth by Premier Zhao Ziyang and in urban and rural environmental construction achieve the demands of "putting a stop to the intensification of environmental pollution; and bring about improvements in the environment of key regions." Currently, our waste in production, construction,

and circulation is very alarming and environmental quality has also gone beyond permissible limits. Thus, the key to laying a good foundation for quadrupling production in the first 10 years is eliminating waste of resources and energy and the pollution that comes with it. If the gross volume of wastes put into the environment now conforms to the permissible density of a locality's environmental capacity, then after quadrupling production, the environmental quality will exceed the tolerable limits by at least four-times, creating a great deal of pollution. So that wastes discharged in the future will conform to discharge standards, it is necessary now to adopt economically effective measures for advanced technological transformation so that the quantity of discharge will at least be reduced to one-quarter the current permitted discharge, otherwise environmental quality will deteriorate even more.

At the meeting held last June to establish the Ministry of Urban and Rural Construction and Environmental Protection, Minister Li Ximing [2621 6932 6900] set forth four professional ethical viewpoints, i.e., the viewpoint of to serve the people and to be responsible to the people, the viewpoint of service for development of production and for all trades and industries, the viewpoint of projects of lasting and vital importance, and the viewpoint of the unity of economic benefits, social benefits, and environmental benefits; in December, Minister Li also set forth a principle at the National Environmental Protection Work Conference: "Only if environmental protection work is intimately linked together with realizing the strategic goal of national economic construction can it constantly receive new impetus and create new work prospects." These four viewpoints and one principle conform to the spirit of the 12th Party Congress and the Sixth Five-Year Plan and should similarly guide the strategic thinking of our work.

II. Do a Good Job of Environmental Protection Work in Production and Construction and in Urban and Rural Construction

A. Environmental protection should serve production and construction: According to the economic construction policy, 1) in accelerating the growth of agriculture, promoting the afforestation of hilly land may regulate climate, prevent soil erosion, and protect the natural environment; rational use of urban and rural polluted water for irrigation and fish culture may increase production, reduce costs for treating polluted water, and avoid the pollution of bodies of water; utilizing lake embankments for raising aquatic crops may clean up polluted water, produce food, and develop bioenergy resources; rational use and developing natural resources and water resources may lower costs, and reduce environmental pollution; developing methane energy, solar energy, wind energy and geothermal energy and using agricultural chemicals which are highly effective but have low toxicity can further improve production, lower costs, control pollution and turn injury into profit. 2) In terms of technological transformation of existing enterprises product plans should be improved, production technology should be reformed, backward facilities should be renewed, non-toxic raw materials should be used, escapes, emissions, drips and leaks should be eliminated, resource recovery should be strengthened,

the three wastes and excess heat should be used comprehensively, the three wastes which cannot be used economically should be dealt with properly, labor insurance, greening, and beautifying the environment should be strengthened, firms which manufacture products the supply of which exceeds demand and whose quality is low, consumption of energy and raw materials is high, have been losing money for a long time, and are serious polluters should be "closed, suspended, merged or retooled," thus achieving the unified goal of eliminating waste and pollution, upgrading product quality, and lowering production costs. 3) In the direction of service to developing consumer product industries and readjusting heavy industry and strengthening energy resource and communications construction, consumption norms should be strictly controlled, comprehensive utilization of the three wastes and excess heat should be implemented, the depth of coal and petroleum processing should be upgraded, comprehensive utilization of coal and joint petrochemical industry firms should be developed, hydroelectricity, thermoelectricity, and communications and transportation should be developed, great effort should be made to save energy, including direct and indirect energy consumption in product manufacture and communications construction, and direct and indirect energy consumption in product use and maintenance and in communications and transportation, and thus upgrade economic results, environmental results, and social results.

B. Environmental protection should serve urban and rural construction: In line with the two principles of "combining city and countryside, agriculture and industry, is good for production and makes life more convenient" and "comprehensive planning, rational distribution, comprehensive utilization, turn harm into benefit, rely on the masses and everyone to act, protect the environment and create wealth for the people," we should do the following:

1) In urban and rural construction planning, national and local renovation should be combined, urban and rural quality should be determined, urban and rural scale should be controlled, functional areas and industrial, agricultural, and commercial construction should be arranged, fully equipped residential construction should be intensified, public use and municipal government construction should be improved, education, science, culture and public health should be developed, gardening, afforestation, and greening should be strengthened, and plan control should be strengthened. 2) In traffic and communications, improving surface traffic should be stepped up and high speed traffic and underground traffic be gradually developed, public buses and trackless trolleys should be increased rationally, posts and telegraph communications should be strengthened, and traffic noise controlled and motor fuels improved to prevent traffic pollution. 3) In water supply and sewage, construction of surface and underground water facilities, water plants and sewage treatment plants should be increased, foul smelling rivers should be eliminated, hospital sewage should be disinfected, water supply management should be strengthened, and pollution resources used scientifically to prevent pollution of bodies of water. 4) In coal fuels, coal washing and sorting should be strengthened, boilers improved, combustion improved, smoke-scrubbing chimneys should be installed, urban coal

gas, centralized heat supply, and excess heat utilization should be developed, cinders and powdered coal ash should be utilized, flue gases should be washed, honeycomb coal briquet stoves should be improved, formed coal lumps should be utilized, chimneys should be improved, solar energy should be developed, geothermal energy should be utilized, fuel management and fuel economizing strengthened to prevent atmospheric pollution. 5) In refuse, waste recovery should be strengthened, refuse collection and transport should be improved, organic and inorganic refuse should be utilized, refuse management and the patriotic sanitation movement should be strengthened and environmental sanitation improved.

III. Strengthen Scientific Research on Environmental Protection and Environmental Monitoring Management Work

A. Scientific research should create economic benefits: Last October at the National Science and Technology Awards Meeting, Premier Zhao said, "Economic promotion must rely on the advances of science and technology." "Science and technology work should be geared to economic construction. The realm of scientific research is very broad and there are many topics, but in first place is the key scientific and technological topic which has great economic benefits in researching economic construction." "When determining the key problems to be attacked, we should be very careful that topics which do not have economic benefits are not included. Everything that must be classed as a key topic must be able to produce important economic benefits within a certain period of time. We should guard against the appearance of 'key project and key waste'." These directives clarify for us the direction for improving environmental protection scientific research work. We certainly should proceed from actual needs, unify planning and organize key problems to be tackled, secure actual results, carry out promotion of results and create economic, social and environmental benefits.

Beginning last year, the State Economic Commission began to stress key projects in environmental protection scientific research and made the following stipulations: The principles of selection should focus on problems in current environmental protection work that urgently need to be solved, which have breakthroughs in technological key areas, and which have great value in terms of environmental and economic benefits; the topics should clearly state the mission of the key problem to be attacked and specific goals, present a scientific research plan and assess the economic benefits of the results; conditional guarantees should present a rational budgetary estimate and determine cooperating units. These stipulations are all very apt. However, when establishing state key scientific research projects, whether the upper echelon sections in charge can directly sign contracts with scientific research units and have local sections in charge acting as third parties, and whether key projects to be tackled can be approved without detailed plans and a detailed list of expenses are questions which have yet to be researched and resolved.

To promote the development of scientific research work, the State Scientific and Technological Commission has measures for technology transfer, technology contracts and consulting service, and combined scientific research and production which can accelerate the promotion and application of scientific research.

results. However, there is as yet no reward system actively being pursued for the results of invention and creation and technological reform. We propose that when signing a scientific research contract, it be specified that after the results of the scientific research have been adopted in production, rewards be granted in accordance with "Articles on Rationalized Proposals and Technological Innovation Rewards" which was promulgated again by the State Council early last year, so as to further mobilize the initiative and creativity of scientific and technological personnel.

B. Monitoring management should be vigorously strengthened: Comprehensive control of environmental pollution requires that environmental monitoring and environmental management work be strengthened. Yet, because the relationship between our country's environmental management sections and the enterprise units which discharge pollutants is different than it is abroad and since the enterprise units lack the technological strength, in addition to strengthening environmental management and promoting enterprise control in accordance with the relevant laws and regulations, management sections also are responsible for helping enterprises resolve problems of controlling technology. At the same time, environmental monitoring sections not only should establish an external environmental monitoring system, but also help important enterprise units establish internal monitoring systems and rely on enterprise employees to strengthen quality control; not only should they measure and appraise external environmental quality, but also they should assess pollutant runoff and economic loss, trace pollution sources, and promote the development of enterprise control work.

In environmental management, in recent years places have been implementing the method of collecting fees for discharge of pollutants beyond target limits with some results, but since the goal of charging fees for pollution beyond target limits is only to foster control, determining standards of pollution discharge should have an economically effective control technology as a basis and there should be appropriate channels for the money raised from control charges so as to create the conditions for the enterprise to exercise control. With practicable control methods, if an enterprise does not carry them out, they can be dealt with according to the law. There should be two classes of discharge standards for water pollutants. One is standards for materials which are extremely dangerous and cannot break down gradually in the environment and which cannot be exceeded. This class of liquid waste must be treated within a certain period of time within the enterprise and heavy charges assessed for the untreated portion beyond the standard. For the other category of liquid wastes such as domestic waste water, pollutants which can break down in the environment, an enterprise can be permitted to exceed the standard which is then discharged after municipal centralized unified treatment and the enterprise charged appropriately for the portion beyond the standard to help with the expenses of municipal centralized treatment and to avoid the waste created by the decentralized treatment of each entity on its own. If both categories of liquid wastes are treated within the plant and used for economic purposes, they should not be discharged. In addition, in accordance with the stipulations of the Sixth Five-Year Plan, apart from the "three simultaneous efforts" which must be upheld for newly built projects, we should stress control of pollution in old enterprises by stages in turn; sections

in charge should draft overall plans and implementation proposals to combine enterprise readjustment, reorganization, technological transformation, and pollution control.

IV. Improve Assessment of Environmental Impact and Propaganda and Educational Society Work

A. Assessing impact should have comprehensive technological and economic documentation: In line with the stipulations of "Management Methods for Environmental Protection in Capital Construction Projects": The construction unit and the section in charge must formulate an environmental impact statement for the capital construction project on the basis of feasibility research of the capital construction project. In environmental impact assessment abroad, initially they only assessed the impact on the environment and its economic and social impact. Now, in theory this has extended to the following items: 1) Account for the activities in the plan proposal which might have an impact on the environment; 2) Explain the statistical basis for determining this impact; 3) Discuss the importance of these impacts; 4) Compare other proposals which might change these impacts; 5) Explain the comprehensive assessment of the plan proposal's technological and economic environment. In settling on a plan proposal there should be technological and economic comparison of different proposals and an explanation of the scientific evidence for the proposal selected and the priority rights if its rational use in the environment is in question. These principles deserve our consideration. The resource saving and energy saving, and the advanced technology of controlling environmental pollution of relevant countries abroad merits our conscientious study. We must get a clear understanding of the goals of assessing environmental impact, not just in understanding the world, but that the goal of understanding the world is only to transfer the world; therefore, we should thoroughly change our past one-sided work style of "insincere evaluation and hypocritical calculation," "only evaluating the effect, not evaluating the cause, only evaluating attitude, not evaluating the economics," and propose plans to eliminate waste and control pollution, to actively serve economic construction, urban and rural construction, and environmental protection.

B. Propaganda, education, and academic society work should be conscientiously improved: Environmental protection is a new science which is very comprehensive and should be reformed conscientiously. In the past, we one-sidedly propagandized the dangers of environmental pollution and ideological imbalance and reports that foreign countries were spending large amounts of money to control pollution, and demanded that the state increase the budget to improve the environment, but policymakers believed that "environmental protection is important, but we cannot afford to deal with it now."

After Premier Zhao issued a directive on the advanced experience of self-reliance, comprehensive utilization of resources, energy and the treatment of the three wastes by the Anshan Steel Works, there emerged a group of advanced units that achieved notable results in economic benefits, controlling pollution and protecting the environment. This proves that we have found a way to obtain environmental

benefits and promote production and development that is inexpensive and produces quick results. This is a good example of implementing the spirit of the 12th Party Congress and the policies on economic construction, urban and rural construction and environmental protection. We should sum up these experiences, and pass on and popularize them in propaganda, education, and academic society work. In the area of environmental propaganda, we should change the past one-sided emphasis on pollution damage and neglect of waste to a guiding ideology of commending comprehensive utilization, turning waste into profit, advanced technology, cost efficiency, measures to raise funds, economic management and other advanced experiences. In the area of environmental education, economic, social, and environmental benefits should be improved, and start by laying a good foundation for quadrupling production, reform teaching materials at all levels, carry out school education, after-hours education, and cadre training work on environmental science and environmental engineering. In environmental societies, regional branch societies and relevant sections should be mobilized to collect advanced examples of environmental protection, propaganda, and popularization should be carried out, at the same time ascertaining difficult problems which still exist, organize technological consulting service and help resolve them, and also domestic and foreign environmental protection scientific and technological information and experience exchanges should be strengthened, specialists trained, the quality of environmental publications upgraded, and in cooperation with other concerned learned societies together struggle to serve production and construction, urban and rural construction, and environmental protection, and to create new prospects for urban and rural environmental construction.

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NEW WAYS TO REFORM SYSTEM OF ENVIRONMENTAL RESEARCH EXPLORED

Beijing ZHONGGUO HUANJING KEXUE [ENVIRONMENTAL SCIENCES IN CHINA] in Chinese No 2, 1983 pp 6-10

[Article by Liu Hongliang [0491 7703 0081], Chinese Institute of Environmental Sciences: "Some Thoughts on Opening Up a New Prospect for Environmental Research in China"]

[Text] A review of the development of environmental protection efforts in China during the past 10 years shows that with vigorous support from the state, China's environmental science has advanced by leaps and bounds, and is thriving. The state now has established the Chinese Institute of Environmental Sciences, and has also established environmental protection research organizations in most provinces, municipalities, and autonomous regions. These, plus the Chinese Academy of Sciences, institutions of higher learning, and environmental protection research systems in all industrial sectors constitute a preliminary corps devoted to environmental research nationwide. The country has simultaneously set up an environmental science information network and an environmental monitoring network. It is now in the process of setting up a national environment analysis and testing center. Everywhere, environmental research organizations at all levels are vigorously engaged in scientific research on management of the environment, on guarding against environmental pollution in multiple ways, on environmental planning, and on the quality of the environment, and they have scored outstanding achievements. Nevertheless, development on environmental science endeavors still lags behind events, and how to meet needs in building socialist modernization and development of environmental science are questions that we must study diligently and answer.

I. Need for the Direction of Environmental Sciences Research To Secure Three Benefits.

Modernization of environmental protection is a major integral part of the building of the national economy and of society. The goal of environmental science research lies in advancing early modernization of environmental protection. One might say that without development of environmental science endeavors, there can be no modernization of environmental protection endeavors. Development of environmental science endeavors is the crux and a precursor of the modernization of environmental protection.

A good job of environmental research work requires particular attention to taking firm hold of the direction of research. Environmental science is strikingly different from natural sciences in general in being of greater personal interest to mankind. It is neither possible to be concerned solely with economic benefits without being concerned with environmental benefits and social benefits, nor is it possible to be concerned solely with environment benefits and social benefits without being concerned with economic benefits. It is necessary to set a direction for scientific research on the overall basis of environmental benefits, social benefits, and economic benefits.

Comrade Zhao Ziyang pointed out that, "Scientific and technical workers should make contributions in every way, and most important is to make contributions in advancing production techniques, and in increasing economic benefits." Environmental scientific and technical workers should consider, first of all, whether the scientific and technical work in which they are engaged meets the needs of the four modernizations, helps improve the environment, and maintains the ecological balance. At the same time, they must also consider economic benefits. A matter that merits our deep reflection is which of the major environmental policies in the development of environmental protection in China during the past more than 10 years have been formulated on the basis of the results of our research. It must be said that they could be counted on the fingers of one hand. Why is it that environmental pollution in China during recent years has not only not been brought under control, but has conversely become more serious? As environmental scientists, these problems merit our deep thought. Solution to China's environmental problems must proceed from the country's realities. First of all, ours is a socialist country, and we definitely cannot take the old capitalist road of polluting first and controlling it later to the detriment of posterity. Second, China is a poor country. Not many funds are currently available to solve environmental problems. The "three benefits" proposal is a difficult problem based on Chinese realities that has been given us environmental scientists that is both a contradiction and that needs to be reconciled. The level of our scientific research should also be reflected in this. Thus, in selecting research problems, we should not always follow along behind foreigners; we should advocate the following three aspects:

(A) Vigorous development of pollution prevention and control techniques that require little consumption of resources for research but produce striking results. Use of "resources cycling principles," on the one hand to improve technology and reduce wastes in production while, on the other hand, demolishing demarcation lines between trades and industries as regards wastes discharged in production, exploring multiple roads, and developing techniques for "turning the three wastes into resources." Things such as "ecology farms," which have emerged in third world countries, and China's own "methane gas pits" should be developed energetically.

(B) Efforts to apply the results of environmental assessment and environmental systems engineering to urban environmental planning, regional planning, and national planning to obtain long-term, large scale multiple economic benefits.

(C) Efforts to improve technical standards in monitoring, analyzing, and forecasting quality of the environment are also problems in managing China's environment currently in urgent need of solution. Unless control over environmental quality can be accurately and promptly extended from individual points to wide areas, integration of "the three benefits" to protect the environment is an empty phrase.

Precisely because environmental protection requires construction that provides no gain, environmental science standards must particularly be reflected in economic benefits under prevailing conditions in China. However, no irreconcilable contradictions exist among environmental benefits, social benefits, and economic benefits. With proper handling, the unity of all three kinds of benefits can be fully attainable, and the modernization of environmental science and environmental protection vigorously promoted.

II. Defining the Theme of Environmental Science Research Work

Environmental science is a new star that has risen in the development of modern science and technology. It has risen out of and developed from the contradictory struggle between mankind's production of and solution to environmental pollution. The nub lies in study of the pattern of interrelationships between man and his environment, and the pattern between energy and material circulation and balance. It bears on both all fields of natural science and on numerous fields of social science, and thus gives rise to environmental biology, environmental chemistry, environmental physics, environmental medicine, environmental geography, environmental engineering, environmental management, environmental law, environmental sociology, etc. This determines, in turn, that the field of study is extremely broad, that it is very complex, and that there is much overlapping in research.

Two main trends in development of contemporary science are comprehensiveness and specialization. Comprehensiveness is extremely manifest in environmental science, while specialization seems very amorphous in environmental science. This is because it has not been in being for very long; the system touches on a wide range of academic disciplines and its structure has not yet set and formed.

As far as the specialization of environmental science is concerned, as environmental science advances, specialization will gradually become defined with practice. Right now there is no need for us to linger over scholastic ruminations. Human society must be based on its own needs and on the laws of development of things, and individual stages pose environmental problems requiring most urgent solution. Consequently, the focus of environmental research differs from country to country, region

to region, and time to time, exhibiting striking social and regional characteristics, so one cannot mechanically copy foreign ways of doing things. Proceeding from current Chinese realities, we must particularly watch new specialized problems that come about on the comprehensive foundation of environmental science, and define the theme or emphasis of research. Unless we do so, the principal direction of attack will inevitably be uncertain, the front too broad, and the fists not tightly clenched, and this will result in no marked results from scientific research.

In accordance with the spirit advanced by the Central Committee that scientific research should be more directed toward building of the economy, and that applied science should be vigorously developed, and on the basis of the principle that environmental research should be oriented toward the integration of environmental benefits, social benefits, and economic benefits, the main theme and focus of China's environmental research work should be in the following three fields:

(A) Monitoring, evaluation, and forecasting of environmental quality.

Despite development of environmental monitoring endeavors in China in recent years, forces are very weak and standards very low. They are unable to meet environmental needs. Overall, the quality of both assessments of the present state of environmental quality, and forecasts of environmental quality are not good, and the practical utility of such assessment is limited. A change in this state of affairs requires emphasis on and initiation of research on the following four matters:

(1) Initiation of research on background values in the environment and the environment's content of major pollutants. This problem has been made one of the country's primary focuses for attack. It has already been assigned and work has begun on it. It is in the realm of applied basic research in environmental science, and it is a major basis for environmental evaluation, standards, planning, and prevention and control countermeasures.

(2) In order to assure environmental monitoring quality, initiation of research on standard methods, and development of standard systems, unification of standard methods and standard samples, and the building of a standard system for environmental monitoring is necessary for insuring accuracy, comparability, and synchronization of monitoring data.

(3) High speed, accurate, and automatic environmental instruments, analytical testing techniques, and development of instruments to do these things are important indicators that environmental science has reached a new level. However, China's current seriously backward state in this regard has yet to arouse sufficient serious concern. This is a major problem in the country's research on environmental quality urgently requiring solution. This bears on the issue of whether or not China will be able to catch up as quickly as possible with advanced world standards in environmental research.

(4) Initiation of study of environmental evaluation methods. Currently evaluation methods are very numerous, each of them having strengths and weaknesses. The future task is to determine the optimum evaluation method suited to all types of areas in China.

Use of the foregoing work as a basis for selecting key cities for an evaluation of environmental quality, and selection of energy, resources, and heavy industry bases (or areas, or sea areas) to evaluate environmental effects. This would be of practical value from both a theoretical and a practical standpoint in showing how to gain the three different benefits.

(B) Vigorous Strengthening of the Study of Environmental Management Science

Efforts should be made to achieve striking progress in the following three fields through current study of environmental management science.

(1) In the realm of environmental economy, application of the analytical methods of environmental economic benefits, comprehensive analysis of production activities, and forecasting the effects of the economy of economic activities. Further improvement, formulation, and use of input-output schedule studies. Such methods have currently reached the stage where they may be preliminarily applied, and they have been promoted in economic units where suitable conditions exist. It is possible to obtain quantitative multiple environmental and economic benefits from them in an overall and complete sense.

(2) Active launching of studies in environmental planning. Future environmental management will have environmental planning at its center. Methods and priorities in environmental planning must be studied, and study made of the coordinated application to environmental planning environmental systems engineering theory, optimized control theory, economic numerical models, and environmental assessment conclusions. The relationship between environmental planning and regional developmental plans and national plans should be studied. Key cities and regions should be selected to do pilot project work in environmental planning.

(3) Acceleration of the study of environmental law for earliest possible formulation of all kinds of required environmental regulations, and all around formulation of environmental quality standards. Initiation of studies in pollution ecology and environmental medicine for the purpose of formulating various environmental regulations and to serve as environmental quality standards.

(C) Initiation of wide-ranging study of comprehensive techniques for the prevention and control of pollution. In overall current environmental science terms, most manpower, material, and financial resources should still be invested in initiating and studying comprehensive techniques for prevention and control of pollution. Strictly speaking, comprehensive techniques for prevention and control of pollution have

not yet been formed into a system. The no pollution and little pollution techniques now being initiated, the purification treatment techniques, the techniques for converting the "three wastes" into resources, environmental systems engineering, and such scientific techniques must be flushed out, improved, and perfected, and gradually formed into a complete system of learning for comprehensive prevention and control.

Study of the aforementioned specialized fields begins with an understanding and assessment of the environment, and proceeds to management and planned control of the environment with application of multiple prevention and control techniques to improve the environment, thereby regulating the relationship between man and the environment to achieve a new balance. This is a total process for solving environmental problems. "Evaluation," "management," and "control" are interrelated and closely combined. Only by using this sequence of ideas for posing and solving environmental research problems can the specialized characteristics of environmental science be gradually defined on a comprehensive basis.

Simultaneous with strengthening of the foregoing research emphasis, one cannot ignore study of basic environmental science theories, of course. For example, study of environmental ecology, and particularly urban ecology, pollution ecology, and protection of nature all play a guiding role in development of environmental science.

III. Rigorous Reform of the Prevailing Environmental Research Management System

Like numerous scientific management systems, the prevailing environmental science research management system is backward in the operation, lacks vitality, has much internal waste, low efficiency, and is most unsuited to needs for rapid development of environmental science endeavors. It constitutes a great obstacle in the way of the modernization of environmental science, and it must be rigorously reformed. Initiation of a new situation in environmental science requires, first of all, a restructuring of the environmental science research management system.

(A) Restructuring and concentration of superior forces to form an environmental science research center with all possible speed.

Modernization of environmental science requires earliest possible establishment of an environmental science research center in China. This "center" must be oriented toward economic construction, serve the two "multiple increases," and serve the modernization of environmental protection endeavors. The "center" should serve a function in planning, organizing, and coordinating China's environmental science research. It should organize forces for an attack on key environmental research problems of general significance for the country as a whole that are of a practical, developmental, and comprehensive nature. Acceleration of the founding of such a "center" is doubtlessly extremely important in providing impetus to environmental science endeavors.

In China today, however, selfish departmentalism manifested in feelings of ownership of a sector and claiming a system as one's own are fairly strong, so fairly serious difficulties exist in rapid organization and founding of such a "center." In view of current circumstances, its realization will probably not be possible until the period of the "Seventh Five Year Plan." But is there anything that can be done to make it happen earlier? The answer is affirmative. There are ways, and the key lies in whether leaders concerned look to the national interest, begin reform, and solve this problem.

Comrade Xiaoping said that "our existing scientific and technical forces are used in too diffuse a way, and their roles have not been brought into full play. Real organization and arousal of initiative in the same way that development of the atomic bomb was tackled during the 1960's can produce tremendous results." It is suggested that leading government organizations currently engaged in drafting long-range scientific and technical plans should act in the spirit of Comrade Xiaoping's instructions and solve problems in founding an environmental science research center so that the emerging, weak scientific and technical corps in environmental science can be organized well and put to use, and limited resources used where they can do the most good. Some key scientific research units will have to undergo necessary readjustment and strengthening in order to hasten founding of the center.

Were several large research units in Beijing having a similar scientific research orientation and scientific components to be suitably restructured so that personnel, financial and material resources were relatively concentrated, the strength needed to found "the center" would exist, and they could play the role of "the center" fairly rapidly. This is one short cut to the formation of "the center."

Once "the center" has been formed, "the center" can take the lead in uniting all environmental science research organizations throughout the country into an environmental science research system to form a network for a coordinated attack on key problems. However, among China's scientific research departments and units a small agricultural economy style of operation still exists that causes trouble, and yearns to be small but all-embracing or large and all-embracing, permitting no interchanges of personnel, no flow of techniques, no passing of intelligence information, and no common use of large advanced precision causing rather serious overlapping and waste in scientific research work. An example is treatment of waste water resulting from electroplating. As many as a thousand units (including industrial plant technical departments) were at one time engaged simultaneously in research on the problem. In another instance, at different times various individual units were engaged in low level overlapping evaluations of environmental quality in the same area. In yet another case, two neighboring units imported the same large precision instruments, the utilization rate for both of which was very low. Even within the same organizations factionalism is so rife that no flow of personnel, equipment, or instruments is possible between the haves and the have nots. Leaders are largely responsible for the rise, growth,

and long-term continuation of this problem. One problem is the selfish departmentalism and the mountain-stronghold mentality of leaders themselves. Another problem is the bureaucratic workstyle of leading organizations. In a certain sense, across-the-board planning for environmental research forces and rational organization of the use of these forces to carry out total war, to make a coordinated division of labor, to achieve overall coordination, and to use the minimum amount of manpower, material and financial resources to complete high quality scientific research has become a top priority matter.

In addition, demolishing the department ownership system also means that it will be necessary to employ some form to combine units organically and closely in the environmental monitoring systems. This includes the environmental scientific research system and the environmental intelligence information system (including the three systems for environmental intelligence, environmental analysis and testing, and environmental monitoring). It will be necessary to form them into a high level combination that helps accelerate progress in the modernization of environmental science.

(B) Establishment of Technical Contract Responsibility Systems

For a long time, the tendency toward egalitarianism in the administration and management of scientific research has created a common situation of holding the iron rice bowl to eat from the same big pot, which has seriously dampened initiative and creativity among scientific and technical personnel. Unless this situation is changed, initiation of a new situation in environmental science research is nothing but an empty phrase. The most fundamental principle in changing this state of affairs is to link the economic interests of units and individuals alike to the responsibilities for which they are responsible and the contributions they make. Individual wages, subsidies, and rewards, and unit collective welfare services should depend on the heaviness of their responsibilities and the size of their contributions.

In concrete terms, the methods of technical contract responsibility systems may be used that link personal responsibilities and verified professional achievements to rewards and promotions. This would stimulate everyone to diligent efforts to get ahead, to study assiduously, and to make greater contributions, and would achieve the goal of the greater the results the quicker one gets ahead.

By contract responsibility system is meant primarily organization of the contracting by academies, laboratories (or institutes) of problems handed down by higher authority. Its first requirement is good performance in ones own position. Verified professional achievements in one's work must be made a matter of record to serve as a principal basis for the upgrading of positions or promotions. Financial rewards should be set, different rewards being given depending on the size of contribution made in one's work. Equitable remuneration should also be permitted for after hours work done in addition to the duties of ones own position.

Founding of a technical contract responsibility system requires attention to solving the following several problems:

First is setting up the "three fixes," namely a fixed organizational system, fixed positions, and fixed duties. Direction and duties are to be clear from academies, to institutes, to departments, to laboratories, and down to individuals.

Second is formulation of standards for checking professional competence. These standards are the foundation for the technical responsibility system. Checking of quality and quantity of scientific research work differs from inspection of quantity and quality of a plant's products. Mostly it is the results of mental labor that are checked, so the difficulty is somewhat greater. How to formulate suitable standards is a tough problem in reform requiring operation of pilot projects and the accumulation of experience.

Third is the issue of the right to make one's own decisions. This means mostly contracting units want the right to select personnel for their own teams (or laboratories) working on problems, and the right to distribute the rewards derived from their contracting. These two rights can neither be denied nor given indiscriminately. Limits on these rights must be carefully defined, and rights, responsibilities, and benefits (rewards and punishments) properly linked.

In addition to contract responsibility systems, contract systems for individual research problems should be tried out and gradually promoted. A method should be established whereby environmental research units can tender bids on individual projects, and contract responsibility systems should be set up. Contract systems should be set up whereby public notice is given for personnel needed for projects, so that increasingly large numbers of scientific research projects are covered by contract agreements. Additionally, agreements should be signed for the care and use of large instruments for transfer of techniques, and the application of research achievements. Scientific and technical personnel should be permitted an equitable portion of net earnings resulting from contract work to encourage the more work the greater the gain.

In short, use of contract responsibility systems and agreement systems in accordance with the principle of mutual benefits for the country, collectives, and individuals, and with the principle of the more the work the greater the gains could widen the cash earnings gap among research laboratories (or groups) and individuals. This would help break the shackles of egalitarianism, bring into full play the initiative and creativity of scientific and technical personnel, and emancipate productivity in scientific research.

While smashing large common pots and iron rice bowls, two bad tendencies should be guarded against. One is to look at everything in terms of money without regard for damage to the interests of the country and collectives. The second is willingness to engage only in short-term

projects that produce highly visible results while being unwilling to accept projects that require a long time and pose great difficulties. Scientific and technical personnel must be indoctrinated in resolutely overcoming the foregoing two erroneous tendencies, subordinating themselves to the country's needs, to produce high quality results on the most difficult research projects, to initiate a new situation in environmental research, and to make greater contributions to the development of environmental science.

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CSO: 5000/4178

REFORMS IN ENVIRONMENTAL PROTECTION WORK URGED

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 4, 1983 pp 4-5

[Article: "Be Determined To Carry Out Reforms, Create New Prospects for Environmental Protection"]

[Text] Reform is a policy decision of the CPC Central Committee. Without reform, the four modernizations cannot be realized. The Central Committee demands that reform run through the entire process of the four modernizations. All fronts, all regions, all sections, all units should have a reform mission, should smash all old conventions, old stereotypes, and old work styles which are outdated and hinder progress, and should study new situations, resolve new questions, summarize new experience, create new laws, and environmental protection work is no exception.

China's environmental protection work has entered its eleventh year. In the past 10 years areas, departments, and enterprises have done a great deal of work and have made achievements. However, we must see that environmental pollution has not yet been controlled and that ecological destruction still has not been stopped. Although we have accumulated some experience in the past 10 years, environmental work is still in the initial stage and we cannot think that everything has been finalized and that nothing can be changed. The "Environmental Protection Law" must be revised and other links must be reformed even more. In particular, we should conscientiously analyze and summarize the guiding ideology, system of regulations, and countermeasures for environmental protection which antedate the Third Plenary Session of the 11th Party Central Committee and uphold whatever is correct and change whatever is out-of-date and incorrect.

Since the Third Plenary Session of the 11th Party Central Committee there have been some changes in the guiding ideology and policy measures with regard to environmental protection. For example, we have gone from prevention and control of pollution to implementing overall management of the environment, from control of individual problems to comprehensive control, from mainly purifying the "three wastes" to mainly combining technological reform and control of pollution, but we can clearly see that whatever link is reformed, the work of that link has had new results, that the work of whichever region has been reformed, the work of that region has made new advances.

Some comrades think that there have not been any good reforms in environmental protection and thus lack a sense of urgency with regard to reform. Have there really not been any good reforms in environmental protection work? Please note the following:

Quadrupling production is the general goal of the struggle of each trade and industry, and for this goal to be realized will require that great developments be promoted in environmental protection. Yet, doing a good job of environmental protection is to protect the material base for quadrupling production and this is an important aspect of serving economic construction. Each trade and industry is serving quadrupling production and our environmental protection work also should serve production, otherwise environmental protection work will have difficulty in creating a new situation. This is an important matter which demands reform.

Another issue is that agriculture is the primary point of emphasis for developmental strategy but the damage done to our national environment has still not been forcefully stopped and has seriously hindered the development of agricultural production. The 12th Party Congress said that in the future, while resolutely protecting agricultural resources and maintaining the ecological balance, we must produce more food and economic crops. The environmental work of many of our regions has still not made a breakthrough in this area and some still cannot even break out of the old convention that "environmental protection is preventing pollution" and view protecting the agricultural ecological environment as outside their responsibility. If this thinking does not change, it cannot adapt to the development of the situation. Doesn't this really need to be changed?

Yet, another matter is that for a long time now environmental protection work has "stressed the hard and slighted the soft," emphasizing the hard sciences but not paying sufficient attention to research and application of the soft sciences. This phenomenon has seriously hindered the comprehensive development of environmental work. Since the Third Plenary Session of the 11th Party Central Committee, a large quantity of facts prove: whatever link, region, section, and enterprise changes their "stress the hard and slight the soft" thinking and implemented "carry out the hard and soft together," their work can develop rapidly and comprehensively, and their hardware increases in vitality. Our work in environmental control, scientific research, monitoring, and education must break free from "stress the hard and slight the soft" and purely focusing on hardware, i.e., stressing hard sciences but not relaxing research and application in the soft sciences.

It is not hard to see from the above three examples that the guiding ideology, industrial scope, work emphasis and countermeasures for environmental protection all urgently need to be changed, developed and upgraded. We should be determined to carry out reform, summarize experience, strengthen investigation and research, smash the old ways and create new, and blaze a new path of environmental protection which has China's own characteristics.

In the past, our environmental protection work absorbed some experience from abroad and this was necessary. However, we should see that some of these things are worth copying, but some of them do not conform too well to China's national circumstances. In the past, since we lacked experience we also didn't have time to systematically distinguish between them and digest them, but now in the spirit of reform we should distinguish, digest, and create anew. The complete economic models from abroad in which we engage not only hinder economic development, but also bind our environmental work hand and foot. Some of the effective traditional methods of our own environmental protection, such as comprehensive utilization, crop protection, sewage irrigation, fully utilizing self-purification capabilities are considered valuable by foreign scholars, but some of our own comrades don't give them sufficient consideration so we should summarize and improve using modern science.

Some comrades think that environmental protection work should be strengthened but that it is not a matter of reform. To be sure, since environmental protection work was created not long ago its foundation is still weak and it should certainly be strengthened. But if we do not adopt new methods and walk new paths it will be very difficult to satisfy the demand of strengthening. Agriculture has been the front which has caused us the greatest anxiety, but why has it taken the lead? The main reason is that we have carried out major reforms in agricultural policy, system and management and administration. Take the environmental protection front, for example. In the past, the Capital Iron and Steel Company, the Shenyang Refinery, the Suzhou Huasheng Paper Mill all were units which polluted the environment seriously and caused people great anxiety. Why did these old troublesome units in just a few short years in one leap become advanced units for environmental protection and production nationwide? The reasons may be various, but the most fundamental is that on the basis of the guiding ideology of environmental protection and the directions and policies since the Third Plenary Session of the 11th Party Central Committee, they became liberated from the old concepts and old ways of doing things, and dared to create new things and were good at creating new things. Don't we have many other provinces, cities, regions, and counties and many sections which have replenished their strength and strengthened their work because they dared to smash the old and create the new? An important revelation which the advanced units give us is: One can become strong only through reform.

Reform is a very profound revolution and daring to reform is the most valuable quality of the revolutionary. We should conform to the historical tide and stand in the forefront of reform, carry out reform in an orderly fashion, actively and seeking truth from facts, to build a clean and beautiful environment, to make a new contribution to protecting resources, maintaining the ecological balance, and promoting economic development. We believe that this year's environmental work will make greater breakthroughs.

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CSO: 5000/4162

NOISE CONTROL LEGISLATION REQUIREMENTS SURVEYED

Beijing FAXUE YANJIU [STUDY OF LAW] in Chinese No 6, 1982 pp 43-47

[Article by Wen Bobing [2429 0130 1456]: "A Brief Discussion of Noise Control Legislation"]

[Excerpts] Drafting a Noise Control Law Is an Urgent Concern

Noise has been called a "slow poison"; it does harm in a variety of ways. If people work in a relatively noisy environment (exceeding 90 dB) they may find the noise unbearable, and with time their hearing may become less sharp or noise deafness may result. Intense noise may also produce headaches, insomnia, vascular spasms, impaired digestion, and general lassitude, leading to heart disease, hypertension, ulcers, and nervous dysfunction.

Noise can distract people's attention and sometimes may decrease their labor productivity and work efficiency. Under the influence of extremely loud noise, sensitive measuring instruments may malfunction, and building disasters may be caused. It can make walls crack, glass shatter, and chimneys collapse, and can even cause "noise fatigue" and damage to steel structures.

Noise has become one of the world's major menaces. For example, in Japan, urban noise has become a serious social problem. According to a survey by the Japan Ministry of Education, more than 10 percent of schools cannot hold some classes because of noise interference. Some schools have been rebuilt as windowless multistory buildings using solely artificial lighting. The harm done by noise is greatest in the low-income districts; the residents of some of these districts block their ears with cotton in order to sleep. The number of court suits by urban dwellers who have suffered harm from noise has gradually been increasing. In 1966, there were about 8,000 cases involving harm from noise and vibration, and in 1971 the number had increased to 22,000. In recent years, cases involving harm from noise and vibration in Japan's major cities have accounted for more than a third of all public nuisance cases, and they account for as much as 65.2 percent of the total in some medium-sized industrial cities.

Survey and research results from many countries indicate that transport noise is a major source of urban environmental noise, accounting for about 70 percent of the total. Recent studies in China by relevant research organizations

indicate that vehicle and air traffic in Beijing, Shanghai and Tianjin are less than in New York, London, Rome and Tokyo, but transport noise is generally greater than in those foreign cities. At the same time, industrial noise from such industries as textiles, machine buildings, metallurgy, shipbuilding and petrochemistry is uniformly too loud in China. There have been many cases of complaints by factory workers as a result of long-standing failure to solve the problem, and in some cases there have even been fights, leading to severe injury.

Building construction noise and noise from societal activities are also serious everywhere. In large cities such as Shanghai and Beijing, letters on harm done by noise are the largest single category in the mail received from the masses by environmental protection departments. Decreased noise pollution is now being vigorously demanded by the masses.

The history of struggle against noise and vibration abroad indicates that an improvement was made possible only by strengthening noise control legislation. Without clearly specified legal provisions regarding noise and specific legal standards it is impossible to eliminate or decrease noise pollution. Although China has already promulgated the People's Republic of China Environmental Law (Provisional Implementation), this is simply a basic law on environmental protection and contains only simple statements of principle on noise control, so that it is incapable of solving the noise control problem. In order to decrease urban noise, guarantee the people's health, assure that the masses can work, study and rest in quiet surroundings, increase labor productivity and work efficiency and accelerate the four modernizations, we must establish effective laws in this area. Drafting urban noise control laws is indeed an urgent need.

China's Noise Control Legislation

China now urgently needs to draft and promulgate laws in such areas as urban noise control, and it needs to concentrate on solving the following problems.

1. Environmental Noise Standards

The state must draft urban environmental noise standards to function both as standards for evaluating environmental quality and as management standards for noise control. The standards must include different requirements for different areas. Urban environments can be divided into six general categories:

(a) special residential zones, which are residential districts (such as rest and recuperation zones) which have been designated by the people's governments as needing to be especially quiet; (b) residential, cultural and educational zones, i.e. purely residential zones and cultural-educational or administrative zones; (c) class 1 mixed zones, i.e. ordinary mixed commercial and residential zones; (d) commercial centers and class 2 mixed zones, i.e. busy commercial concentrations and mixed industrial, commercial, some transport, and residential districts; (e) industrial concentrations, i.e. zones which have been designated by the local governments as industrial zones; (f) areas on main transport routes, i.e. areas on both sides of roads carrying at least 100

vehicles per hour. The assignment of districts to the above six categories for the purpose of setting maximum permissible noise levels must be undertaken following discussion by local environmental protection departments and city planning departments, and the results are to be issued by the local People's Governments.

2. The following measures must be taken for control of transport noise.

a. Control of motor vehicle noise. The use of motor vehicles within cities must be in accordance with the "Permitted Noise Levels for Motor Vehicles" issued by the State General Office of Standards on 1 July 1979 for trial implementation. Existing vehicles which do not meet these standards must be brought into agreement with them within a fixed time period; otherwise they may not be operated. Newly-produced motor vehicles must all be tested against these standards, and those which do not pass may not be issued operation permits.

When motor vehicles enter urban areas, they must follow traffic regulations, must be operated in accordance with specified times, routes and speeds, and must use their horns reasonably. They may not use loud or unusual horns. The noise level produced by the horn must not exceed 105 dB at a distance of 1 meter directly in front of the vehicle. Signs forbidding the sounding of horns should be posted in convalescence, cultural and hospital zones. When all types of motor vehicles (except emergency vehicles such as fire trucks, ambulances, construction wrecking trucks and guard vehicles) are being driven in areas where signs forbidding the use of horns are posted, they must not use their horns. If they must use their horns on other roads, they must use them as little as possible and for short periods, not sound them continuously or for long periods. Sounding the horn to summon people to the door is forbidden. Other than fire trucks, guard vehicles, ambulances and engineering wreckers in the performance of their duties, the use of sirens is prohibited. No other vehicles may be equipped with sirens without permission from the public security departments. The cognizant public security and transport departments and vehicle-using units must include noise control in their vehicle management rules and regulations.

Passage of tractors through cities must be strictly controlled. When there is a temporary urgent need to pass through cities, permission must be obtained from the public security departments and a permit issued.

In building new residential districts and constructing or reconstructing transport routes, when urban planning, environmental protection, building design or municipal government engineering departments adopt measures they must keep residential districts at some distance from transport routes in order to prevent transport noise from bothering the residents.

b. Railroad noise control. Train operation must be required to observe strictly the railway technical management regulations issued by the Ministry of Railways. All locomotives entering city limits, with the exception of emergencies, must use air whistles rather than steam whistles. Motor-driven boats must be equipped with mufflers, and when they enter urban areas they

must use their horns in reasonable fashion in order to decrease noise. Urban planning must gradually change rail routes through cities. No new rail routes may pass through urban areas. In the case of existing routes through urban areas, the railway departments must take comprehensive steps to control noise.

c. Control of aircraft noise. Existing airports near urban areas must strictly control low-altitude flight over them. Residents living within 1 km on either side of aircraft flight paths within 5 km of the ends of the runways shall be given state subsidies, and the airfields must be responsible for moving safety zones. New airports must be situated far away from urban areas, and it must be assured that aircraft takeoff and landing flight paths do not pass over cities; no aircraft involved in flight training may practice or circle over city areas. The Civil Aviation Bureau must expeditiously draft environmental noise standards. Large international airports must establish noise monitoring systems in timely fashion, and a fee system for all aircraft, regardless of registry, which exceed the airport noise standards must be instituted.

3. Control of industrial noise requires that the following measures be established.

a. Control of machinery and equipment. State noise standards must be drafted for machinery, equipment and mechanical and electrical products which produce noise and vibration. When manufacturing industries produce these items in the future, they must undergo noise inspection by the relevant departments and meet state standards before they may leave the factory. These products must be labeled with noise level ratings.

b. Protection of residential districts. Industry (including neighborhood factories) located in class 4 zones, i.e. mixed industrial, commercial, limited transport, and residential zones, must not have equivalent noise levels 1 meter outside the plant premises exceeding 60 dB in daytime and 50 dB at night. Plants and enterprises exceeding these standards must take steps to make their noise levels satisfy the standards; otherwise they must move. It is not permitted to build, expand or rebuild plants and enterprises which exceed urban environmental noise standards in special residential zones, residential zones or cultural zones.

c. The "three simultaneous" requirement. All enterprises which are being constructed, expanded or reconstructed must design, construct and commission noise and vibration prevention facilities at the same time as the main facilities. Industrial enterprises which are under construction and which have not taken noise prevention and control measures must make the modifications within a specified time period; otherwise they may not begin operations.

4. Building construction noise control requires the following measures.

a. Major construction machinery producing large amounts of noise which is used in open-air work in urban areas must, if possible, be equipped with noise insulation or noise-reducing accessories. Noise levels from major construction machinery and equipment at a distance of 30 meters or more from the

boundary of the construction area may not exceed 75 dB, and noise from percussive equipment (such as pile drivers, rivet guns and the like) may not exceed 90 dB.

b. Drafting of state noise standards for construction machinery and equipment. The noise of all construction machinery and equipment on construction sites must be in accordance with the abovementioned standards.

c. Protection of residential zones. Noise levels from construction work in residential zones during the nighttime (generally from 10 pm to 6 am) must not exceed the urban area environmental noise standards; otherwise, construction will be forbidden.

5. Noise control for societal activities must include the following measures.

a. Loudspeakers may not be used outdoors in urban areas: with the exception of public security vehicles, loudspeakers may not be installed on propaganda vehicles. If there is a real need to install them, permission must be obtained from the local environmental protection department.

b. Broadcasting for morning or working-hours calisthenics by all units must be at low volume and must not affect neighboring units or residents.

c. Organizations' or families' television sets, tape recorders, radios, musical instruments and the like must be played at appropriate levels so that the equivalent noise level outside the premises does not exceed urban area environmental noise standards or affect the peace and quiet of the surroundings.

d. In class 1 and 2 zones as described above, loud talking and laughing is prohibited at night; the noise level must not exceed urban environmental noise standards in order to avoid disturbing other residents.

6. Management organizations. Urban noise sources are widespread, have high volume and occur under complex circumstances. Management of urban noise requires all relevant departments to coordinate with each other and makes it necessary to have a cognizant organization for central command. Based on China's circumstances, the environmental protection organizations, under centralized organizational leadership of the People's Governments at the various levels, should be the cognizant bodies, and responsibility should be divided among the public security, transport, labor, industry, railway, civil aviation and military departments, who should cooperate actively.

7. Legal sanctions. Administrative sanctions such as warnings, confiscation, revocation of licenses, fines and the like, or civil penalties such as compensation for damage should be drafted to deal with persons directly responsible for violating the urban noise control laws or the principal management of organizations which violate them, based on the nature and circumstances of the violations; in the case of aggravated violations and serious consequences, the courts should determine penal responsibility.

SYSTEM OF TWO-FINES IN ENVIRONMENTAL LAWS DISCUSSED

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 4, 1983 pp 9-10

[Article by Cheng Zhengkang [4453 2973 1660]: "Why Have We Stipulated a 'System of Two-Fines' in Environmental Laws"]

[Excerpts] In their environmental laws and regulations, many countries have stipulated that certain acts which violate environmental protection laws, in addition to punishing the offender directly, enterprises and other individuals who are "accomplices" in terms of traditional ideas of right and wrong are also penalized. This does not conform to the principle of "blame extends to the individual," in particular that blame extends to the natural individual, in legal theory of the past, and it should be noted that this is one development of legal theory in environmental law. We call this system "the two-fines system," for short.

China's environmental protection law also stipulates a "two-fines system" in principle. Article 32, Section 2 of this law stipulates: "Leadership personnel, personnel who are directly responsible, or other citizens of units which seriously pollute or damage the environment, cause death or injury to personnel or create serious loss to agriculture, forestry, animal husbandry, sideline production, and fisheries should be investigated to determine administrative responsibility and economic responsibility or even investigated according to the law to determine criminal responsibility." This section also stipulates that while investigating and determining the responsibility of these people, it is also a two-fines system.

In view of the important significance of the two-fines system for environmental protection, and the practice of various countries proves that it is an effective measure, in China's future environmental legislation we should focus on adopting a flexible two-fines system for specific circumstances:

- 1) If illegal acts are caused by the instigation of a unit's leadership, then the two-fines systems of penalizing the unit leader and the enterprise should be adopted and the investigation and determination of responsibility of the said unit leader should be stressed, but should not be overly severe in investigation and determination of the responsibility of the perpetrator;

2) If the illegal act is not brought about by the instigation of the unit's leader, but is due to insufficient education and poor management of subordinates, then the two-fines system of penalizing the unit leader and the person directly responsible should be adopted and, depending on the circumstances, either investigate and determine primarily the responsibility of the perpetrator and the responsibility of the enterprise leader or the enterprise, or at the same time, investigate and determine the responsibility of the perpetrator and the enterprise leader.

3) If the illegal act is due to ignoring regulations, disregarding management or was done without authorization, then the stipulations of the proviso part of the Japanese "Pesticide Control Law" should be adopted, to investigate the responsibility of the perpetrator, but not the responsibility of the leaders of the unit.

4) China should adopt the two-fines system of penalizing the enterprise and fining the perpetrator for the discharge of pollution to promote an intensifying of the sense of responsibility of working personnel at all levels, and prevent breakdowns and severe escapes, emissions, dripping, and leaking, and rapidly change the backward situation in China's production management. Depending on the specific circumstances in the enterprise the natural person of the incident may be one person or may be several persons, and it may be a worker, a staff member, or a unit leader.

In sum, implementing the two-fines system is beneficial to environmental protection, and we should focus on China's specific conditions, intensify research to make it even more precise, and let this new penal system play a role in China's environmental protection work.

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CSO: 5000/4162

ENVIRONMENTAL PROTECTION ARBITRATION AGENCY PLANNED

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 4, 1983 pp 11-12

[Article by Deng Jianxu [6772 1696 3563]: "Some Questions on Establishing an Arbitration Agency for Environmental Protection"]

[Text] Note: Recently, this magazine has received a series of letters from readers asking questions about the establishment of an arbitration agency for environmental protection. We have summarized these letters into four general categories and have invited Comrade Deng Jianxu of the Faculty of Law of Suzhou University to respond.

1. Why propose an arbitration agency for environmental protection within the Ministry of Environmental Protection?

This was proposed mainly in view of China's present circumstances and urgent need to establish a rather authoritative specialized agency to handle pollution disputes. Some comrades suggest that an arbitration agency for environmental protection be set up independently of the environmental protection departments, under the jurisdiction of the Central Committee and various levels of local people's government; other comrades suggest that environmental departments lead the way and organize arbitration agencies for environmental protection in concert with relevant departments in charge of production. Of course, this is an academic question which it would be well to discuss, but the urgent matter is to establish an arbitration agency for environmental protection as quickly as possible in order to enforce the law strictly and accept and hear pollution dispute cases according to arbitration procedures. In recent years, the volume of pollution dispute cases has been rather great. According to statistics from Shanghai: In 1979, there were 339 disputes between plants and the masses; 81 of these were conflicts, and 49 caused partial shut downs of production, with production stopped for a total of 668 days at a 30.1 million yuan loss in output value and involved over 4,000 people; in 1980 there were 212 factories and shops involved in conflicts, with a loss of 3.56 million yuan; in 1981 there were 52 conflicts stopping production for 232 days at a loss of 12 million yuan in output value. Recent statistics from the Shanghai Environmental Protection Bureau: In 1982 there were clashes between the masses and the factory at 35 factories, stopping production for 95 days at a loss of 3.76 million yuan in output value. Currently, pollution dispute cases are handled mainly through

administrative means. Because the legal procedures are not complete, it is easy for the facts to be unclear, responsibility to be unclear, evidence to be insufficient, the quality of the cases to be low, and cases being withdrawn with waste of time, manpower, and resources. There have even been serious problems of putting the cart before the horse and the punishment not fitting the crime. Thus, objectivity demands that an arbitration agency for environmental protection be established as quickly as possible. If an agency is established independent of environmental protection departments it will not conform to the spirit of the current vigorous streamlining of state agencies, and even if it is created, there is no knowing how long it will take. If an arbitration agency for environmental protection is organized by environmental protection departments and the relevant departments in charge of production, whether the departments in charge of production are willing to take on the mission is also a problem. Some of the departments in charge of production have not accepted the mission of mediation in disputes over economic contracts, so why should they bother with environmental pollution disputes. Thus, establishing an arbitration agency for environmental protection within environmental protection departments best suits the actual situation.

2. Do environmental protection departments have the authority to arbitrate environmental pollution disputes?

The authority to arbitrate means the authority to mediate and adjudicate a dispute between two parties. Environmental protection departments are state administrative agencies and functional departments of environmental protection. Their scope of responsibility has determined that they not only have the authority to arbitrate pollution disputes, but also to carry out administrative laws and regulations and punish individuals and units which violate environmental protection laws and regulations. For example, warnings and fines. In fact, in exercising this authority, environmental protection departments have mediated and adjudicated a great many pollution disputes and punished individuals and units that have violated the law. Thus, environmental protection departments have arbitration authority for pollution disputes. Just as one of the functions of industrial and commercial management departments is to manage economic contracts and their scope of responsibility determines their authority to mediate and arbitrate economic contract disputes no one has the right to censure them for exercising this right.

3. Is there a legal basis for establishing arbitration agencies for environmental protection within environmental protection departments?

We conceived establishing an arbitration agency for environmental protection within environmental protection departments on the basis of experience in economic and civil trials, the scope of responsibility of environmental protection departments and focusing on China's actual circumstances. Neither the "Constitution" nor the "Environmental Protection Law" in force contain this stipulation, but socialist law is the summation of practical experience and the belief of the knowledge of objective things in the law and are not

formulated by some "great thinker" locked up in his room. Take the "Environmental Protection Law (Provisional)," for example: it was formulated and promulgated through the 30 years of practice since the founding of the People's Republic of China. It is impossible to imagine that right after liberation people could have drafted this law without any knowledge of environmental protection whatsoever. The law is the principle by which the state uses its authority to guarantee that people comply and stipulates what people can do and what they cannot do. But the law in force does not stipulate that arbitration agencies for environmental protection cannot be established within environmental protection departments. Therefore, establishing an arbitration agency for environmental protection within environmental protection departments is not impermissible.

On the contrary, some comrades now want to formulate articles for environmental protection arbitration through legislative procedures to give them legal validity. This is thinking which does not conform to actuality and it does not conform to the laws of people's understanding of objective things. If these "Articles" can be formulated can it become "water without a source or a tree without roots." Obviously, this will not do. I propose that the Ministry of Urban and Rural Construction and Environmental Protection first set up pilot arbitration agencies for environmental protection in specific areas throughout the nation and through practice summarize experience and formulate articles for environmental protection arbitration and then nationwide establish arbitration agencies for environmental protection. State industrial and commercial general administrative bureaus are now drafting articles for the arbitration of economic contracts and have proceeded this way.

4. With an arbitration agency for environmental protection within an environmental protection department, won't the environmental protection department be partial to the aggrieved party?

Environmental protection departments are administrative agencies of the state, represent the state in handling pollution disputes on the basis of facts and in accordance with the law and cannot be partial to either party. In dealing with pollution cases, the Suzhou Environmental Protection Arbitration Agency also frequently encountered instances when the aggrieved party wanted to take advantage of the opportunity to seek excessive compensation. Such unreasonable demands cannot be satisfied. For example, in 1981, 12 agricultural brigades and 5 fishery brigades from the suburbs of Suzhou declared that because pollution of a river caused diminished food production and death of fish and shellfish, they demanded that the polluting unit compensate them 531,200 yuan for their loss. In line with arbitration procedures, the environmental protection arbitration agency studied the case in detail, gathered evidence, and then did the commune and brigade work and finally awarded the communes and brigades 116,900 yuan, less than one-quarter of the amount demanded. This not only resolved the contradiction between the plant and the communes so that the loss of the aggrieved party was compensated, but also the state avoided unnecessary loss and maintained the legal rights and interests of both parties. If the parties think that the environmental protection arbitration agency is partial in handling cases they may take the matter to court and this will more effectively guarantee that the pollution dispute case will be handled fairly and prevent partiality.

LEGAL RESPONSIBILITY ISSUES IN THE MARINE ENVIRONMENTAL PROTECTION LAW

Beijing ZHONGGUO FAZHI BAO in Chinese 18 Mar 83 p 3

[Article by He Ge [0149 2960]]

[Text] The "Law on the Marine Environmental Protection of the PRC" is the nation's first law to strengthen the management and protection of the marine environment. It is also a powerful weapon for us to fight all kinds of illegal and criminal acts that pollute and damage the marine environment. The implementation of the said law is of the greatest importance and significance for the prevention of marine pollution, for the protection of the ecological balance in the ocean, for the rational exploitation and utilization of marine resources and to promote the overall development of marine undertakings.

There are many sources responsible for the pollution and damage to the marine environment, the main ones being pollution by energy-producing enterprises, by ships, by oil exploration and development, etc. The said law proceeds from the actual conditions in the nation and implements the policy of "putting prevention first." It stipulates various specific measures for the prevention and control of pollution and damage to the marine environment and formulates these measures as prohibitive and as obligatory norms. To uphold the gravity of the law and guarantee the observance and implementation of the various mentioned measures, the said law has provisions of principle in its chapter on legal responsibilities, determining the legal consequences to be borne for violations of the said law and determining legal penalties to be meted out. The legal responsibilities differ according to the varying conditions and nature of the violations, but in concrete terms we can divide them into three categories, namely responsibilities for civil compensation, administrative responsibilities and criminal responsibilities.

As to the civil responsibility for compensation, the said law takes as the starting point the protection of the interests that suffered damage and in line with international usage, applies the no-fault principle of responsibility. According to this principle, anyone who causes pollution or damage to the marine environment by a violation of the provisions of the said law, regardless of whether he acted intentionally or negligently, must bear the responsibility

to compensate the economic loss sustained by the aggrieved unit or individual. The only reasons for a relief of liability are if the person who has caused the damage can prove that the pollution or damage was due to an act of war, to a natural calamity that constituted force majeure, or was brought about by negligence or other fault on the part of the administrative department in the execution of its duties when responsible for a lighthouse or other navigational aid, and moreover that the damage could no more be averted even though prompt and reasonable measures had been taken. The amount of compensation should comprise three items, namely the actual loss suffered by the party concerned, the actual or necessary costs incurred by the party concerned to eliminate the pollution, and the loss of normal income suffered by the party concerned due to the pollution or damage. However, in case China has concluded international covenants or participates in such international covenants, which limit the responsibility for compensation, the provisions of these covenants must be followed.

As to the administrative responsibility, the said law stipulates that the administrative department in charge can deal with anyone violating the said law, thereby causing or threatening to cause, pollution or damage to the marine environment, by ordering him to take remedial action within a time limit, by paying a fee for the removal of the pollution, by paying the costs of eliminating the pollution, by compensating the state for damages, and can moreover issue a warning and impose a penalty. The compensation to the state for its losses is here not a civil obligation, but imposed by the administrative department in charge as an administrative responsibility. Furthermore, the administrative department in charge may impose an administrative penalty not only in case pollution or damage to the marine environment has actually occurred, but also in case of a violation of the law that could possibly have caused pollution or damage to the marine environment. The purpose of this provision is to give particular protection to the natural resources in the ocean areas under the jurisdiction of the state.

As to the criminal responsibility, the said law stipulates that the judicial organs may according to law investigate the criminal responsibility of any person who is directly responsible for a violation of the said law and thereby has caused pollution or damage to the marine environment, inflicting serious losses to public or private property or having caused injury or death of others. We see from this provision that one necessary factor to constitute the crime is that the violation of the law which brought about the pollution or damage to the marine environment must have already had the serious consequence of having caused serious damage to public or private property or injured or killed a person. This distinctly differentiates the crime from a general violation of the law. However, since the said law has no specific provisions on the punishment that has to be imposed and the Penal Code too has no provisions on punishing crimes of pollution or damage to the marine environment, the judicial organs can only base on Article 79 of the Penal Code and sentence to a penalty according to the specific provision in the Penal Code for a crime that comes nearest to the one in question; this, however, will have to be reported to the Supreme People's Court for approval. Of course, investigation of criminal responsibility does not take the place of, or free the criminal, from administrative responsibility or the civil obligation to pay compensation.

In its chapter on legal responsibilities, the "Marine Environmental Protection Law" contains specific provisions to solve the procedural problems in disputes over civil compensation and the imposition of administrative penalties, as well as the problem of relations between the administrative departments and the people's courts. In a dispute over civil compensation, the unit or individual that has suffered damage may file a suit directly with the people's court, but he can also demand that the administrative department internally in charge handle the case. If he does not accept the decision of the administrative department in charge, he may still settle the dispute according to the procedure laid down in the Civil Procedure Law. In this way the administrative department can always play the role of first defense line and settle a large number of civil disputes, thereby relieving the people's courts of some pressure. As to the administrative penalty, if the party concerned does not accept the penalty imposed by the administrative department in charge, he may file suit with the people's court within 15 days from the receipt of the decision. If he does not file the suit within the time limit and also does not comply with the decision, the administrative department in charge can apply to the people's court for enforcement. According to these provisions, the people's courts have the dual duty to check whether the administrative department has applied the law correctly and also to uphold its correct decision. In short, the administrative departments and the people's courts must each perform its particular duties in close coordination and mutual respect. They must fully cooperate and jointly bear the responsibility of fighting all activities that violate the "Marine Environmental Protection Law" and that pollute and damage the marine environment, in order to contribute toward the goal of a better quality for our marine environment.

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CSO: 5000/4158

ENVIRONMENT MINISTER COMMENTS ON MARINE LAW

Beijing ZHONGGUO FAZHI BAO in Chinese 4 Mar 83 p 1

[Article by Li Ximing, Minister for Urban and Rural Construction and Environmental Protection: "Implement the Marine Environmental Protection Law and Strengthen Marine Environment Management"]

[Text] The "Law on the Marine Environmental Protection of the PRC" became effective on 1 March. This law follows the PRC's "Environmental Protection Law" (tentative) as the first formally promulgated substantive law on the protection of the environment. Its promulgation indicates that we have entered a new phase of building up a legal system for the protection of the marine environment in the country.

China is a continental, but also a maritime nation. The east and south border the Bo Hai, Yellow Sea, East China Sea and South China Sea, with an ocean surface of 4.7 million km². The coastline is indented and very long, somewhat over 32,000 km (the continental coastline itself is over 18,000 km). There are many excellent harbors and many bays along the coast, advantageous for the development of the nation's shipping and tourism. The continental shelf is broad and rich in mineral and biological resources. Important bases for our modernization drive are located along the coast. Therefore, the protection of the marine environment and the rational exploitation of marine resources are of extreme importance within the framework of our four modernizations.

However, with the exploitation of marine resources, ocean shipping and industrial development in the cities along the coast, the marine environment along our coast has, to varying degrees, suffered pollution and other damages. The cities and industries along the coast discharge annually 6.5 billion tons of waste water into the ocean. Over 100,000 tons of petroleum are annually discharged into the sea from several oilfields and 10-odd petrochemical enterprises along the coast. All this has led to serious pollution of the environment at every river estuary, bay and in parts of the ocean. The oil seepage and blowouts that occur in the course of oil exploration at sea, the waste water from oil tankers and other vessels, threaten the marine environment.

Once the marint environment is polluted and damaged, it cannot be restored in a short time. China has set the great goal of quadrupling its annual industrial and agricultural output by the end of this century, there will be large-scale development of coastal industries, oil exploration at sea and ocean shipping. The international sea traffic will also increase. It is, therefore, necessary to adopt measures before it is too late for the rational exploitation of ocean resources and for the protection of our marine environment and ecology.

The "Marine Environmental Protection Law" strengthens the management of the marine environment and is an important measure to protect the marine environment and resources, prevent pollution and protect the ecological balance. The enforcement of the said law demands a joint effort on the part of all concerned, close coordination, each to perform his own duties, and a coordinated unified effort to protect the nation's marine environment and defend our nation's rights and interests. At the same time, we must work out an effective plan for the protection of the marine environment based on scientific evidence. We must pay close attention to the establishment of a sound organ that will monitor and supervise the marine environment, and we must strengthen the work of monitoring and supervising the marine environment, and formulate a series of specific rules, regulations and standards to provide a complete set of legal norms for the management of the marine environment and to ensure that there is legal backing for such actions and as a basis for legal enforcement.

The "Marine Environmental Protection Law" is a law which protects the rights and interests, and the dignity, of the nation. It applies to the inland seas, territorial waters and other areas of the ocean under the jurisdiction of the PRC. All departments concerned and the local governments at all levels must closely cooperate and jointly bear the responsibility for the enforcement of the law, must bring the role of the masses fully into play in overseeing such enforcement and have all concerned form a network to oversee the enforcement of the law, so as to protect the nation's marine environment and to contribute to the protection of the marine environment of the world.

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CSO: 5000/4158

CURRENT MONITORING DOES NOT ADEQUATELY SERVE ENVIRONMENTAL PROGRAMS

Jinan DAZHONG RIBAO in Chinese 13 Jun 83 p 2

/Article by Cui Qingli /1508 7030 0171/: "An Informal Talk on Environmental Monitoring"

/Text/ At present, there are about 10,000 environmental monitoring points scattered all over the vast territory of China. A professional contingent of tens of thousands engaging in environmental monitoring is on sentry duty for our working and living environment.

Modernization of industrial and agricultural production has brought tremendous advantages as well as disadvantages. Waste gas, waste water, and industrial residue discharged by plants have produced serious pollution; dust, noise, garbage, and radioactive substances in cities also harm human health. Only after environmental monitoring can the degree of pollution be determined to provide a scientific basis for the elimination of pollution and the protection of the environment.

Environmental monitoring consists of two categories, one is source monitoring. Sources may be classified as point sources and mobile sources, the former refer to discharge outlets of industrial waste gas, and water, the latter refer to motor vehicles such as cars, trains, steamers, airplanes, and so forth. Another category is ambient monitoring. It refers to chemical, physical or biological measurements of residuals in the air, water, noise, radioactivity, soil, crops, food and so forth. Monitoring programs should be in line with national unified environmental quality standards.

The division of regions and the distribution of networks for environmental monitoring are based on the geography, climate, ecology, politics and economy as well as the degree of pollution. For example, air quality regions are divided into three classifications, one are national nature reserves, tourist areas, historical sites, and sanitoriums; the second class are residential areas, composite areas of commerce, traffic and residences, cultural areas and historical sites determined by urban plans and vast rural areas, and the third class are cities and towns, and industrial areas with serious air pollution as well as cities that are main lines of communication. Monitoring of major air pollutants include particulates, sulfur dioxide, nitrogen oxide, carbon monoxide, photo-chemical oxidants, etc.

In order to have an overall and accurate evaluation of the environment, ambient monitoring also incorporates the monitoring network of meteorology, hydrology, geology, water conservancy, sanitation, urban construction, public utilities, industry, agriculture, forestry, fishery, coastal areas and major sources of pollution with the regional or national environmental system. After statistical analysis on the monitored data is done, the "Report on Environmental Quality" is compiled to provide an environmental basis for the state and governments at different levels to direct economic development.

At present, China's environmental monitoring depends mainly on the methods of regular collection of samplings and laboratory analysis, monitoring methods do not yet meet the needs of environmental protection. Along with the rapid development of science and technology and research on monitoring methods, continuous automation, and the establishment of computerized and automatic monitoring networks will be realized.

12272

CSO: 4008/155

CAREFUL SITE SELECTION TO CORRECT PAST MISTAKES IN INDUSTRIAL LAYOUT, BENEFIT ENVIRONMENT

Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 12, 1982, pp 4-5

[Article by Zhang Lusong [1728 4389 2646]: "Rationally Distribute Industries To Protect the Environment"]

[Text] The modern city is a composite entity consisting of various parts (industrial enterprises, communications and transportation, houses, public buildings, cultural and welfare facilities). It has developed along with economic development. The industrial district is the main part of a city. If the distribution of industry is not rational, it will directly affect the environment of a city. Countless facts tell us that realizing a rational industrial distribution and protecting the environment well are important issues in the present construction of the four modernizations.

The Importance of the Rational Distribution of Industry From the Viewpoint of Environmental Pollution

What people refer to as the "environment" generally includes two parts: One is the natural environment, meaning the atmosphere, the hydrosphere, the lithosphere and the biosphere. A cycle of new materials released by man is superimposed on the environment within a definite area in nature's material cycle causing this environment within a definite area to possess environmental characteristics and qualities different from other surrounding regions. An environment with a strong regional character is called a regional environment. The second is the social environment. It is the environment created by mankind as he continues to improve his own material and cultural life, such as industries, cities, houses, traffic, entertainment places, cultural ruins and scenic areas. Human activity continues to create better material civilization for man himself, but these activities, at the same time, also affect the environment in which mankind exists, environmental quality deteriorates and directly threatens the conditions for the existence of mankind.

Environmental protection is to protect the air, water sources, soil, and living organisms necessary for human existence and such natural environments so that they are not polluted and destroyed. Its fundamental purpose is to protect health and to protect productive forces. The factors leading to a drop in the environmental quality of a region and the destruction of the ecological balance frequently are due to over concentration of population and economic activity,

and natural conditions. Among them, whether or not the distribution of industry is rational is an important factor. Here, let us take a look at the distribution of the Qingshuitang Industrial District in Zhuzhou City.

The Qingshuitang Industrial District is on the northern banks of the Xiang Jiang. There are the two small harbors, Xiawan and Tongtang, where water flows separately from the central part and the western part of the industrial zone, meets at Xiawan and flows into the Xiang Jiang. The geomorphology of this region is a small basin high in the north and low in the south, and surrounded by hills in the east, north and west. The entire topography slants from north to south towards the Xiang Jiang. The area of the basin is about 12 square kilometers. The center is at an elevation of about 50 meters above sea level. The northern hills rise to a maximum elevation of 176.7 meters above sea level. The major industries are metallurgy and chemical. There are over 20 major factories, including the Zhuzhou Metallurgical Plant, the Zhuzhou Chemical Plant, an ore dressing plant, the Hunan Nitrogen Plant, the Zhuzhou Steel Mill, the Zhuzhou Glass Factory, a phosphorous fertilizer plant, and a farm chemical plant. Each day, a large amount of sulfur dioxide, chlorine gas, fluorides, smoke and various toxic gases are released into the atmosphere. In addition, the topography of the Qingshuitang region is a small basin in a saddle shape, inversion layers frequently occur, toxic gas and mist frequently linger for a long time without dispersing, causing the air to become turbid. In addition, vegetation has been destroyed, it is more difficult to breathe fresh air. Toxic discharge converge in the Xiang Jiang through the two ports of Tongtang and Xiawan and pollute the water system of the Xiang Jiang. At the same time, under the control of the leading north northwesterly and south southeasterly winds that blow frequently throughout the year, hazardous substances enter the surface water system and the groundwater system along with rain and enter farmland and soil and contaminate some rice fields, fish ponds, vegetables and fruit trees in the downwind direction.

The situation in the Qingshuitang Industrial District shows that a close relationship of material exchange exists between industrial production and the surrounding environment. This exchange process is continually increasing and extending its impact on the surrounding environment and society. Therefore, how to rationally develop and utilize natural resources that suit local conditions, how to protect natural resources so that ecological systems will not be destroyed, and how to reduce the discharge of waste gas, waste water and waste slag, are determined to a large degree by the distribution of industry. At the same time, industrial enterprises are the major sources of environmental pollution. How to rationally distribute polluting industries on the basis of the characteristics of the ability of natural purification in each region, especially the distribution and the degree of concentration of enterprises that produce heavy metal pollutants that are difficult to purify, and serious polluting enterprises, are questions that have important meaning in environmental protection.

In addition, because some industries have carelessly selected their sites, the distribution of large, small and third line factories is overly scattered, the distribution within cities is disorderly, undue emphasis is placed on building an industrial system that includes all enterprises, that is independent and

integrated have caused widespread pollution of the environment by the "three wastes" and by noise. Thereby affecting health, and endangering the normal propagation, growth and development of animals and plants. Therefore, we must strengthen comprehensive prevention and control of regional environmental pollution. Among such efforts, an especially important aspect is to correctly locate industrial enterprises and plan urban industrial districts well. At the same time, in industrial production, we should reduce the discharge of the "three wastes" as much as possible, perfect purification and treatment facilities, and combine this effort with greening, and beautification of the environment to improve environmental quality.

How Should Industry Be Distributed To Benefit Environmental Protection

The distribution of industry is a major issue that has a strategic meaning in socialist construction. The distribution of industry requires the consideration of many factors. Environmental protection is one important factor that needs to be considered.

In the distribution of industry, we must not only consider natural conditions, socio-economic conditions and technical conditions, we must also consider questions of fuel, raw materials, water, electricity, transportation and consumption of products. But in regard to the distribution of industry from the viewpoint of how to benefit environmental protection, we should consider the following questions:

1. When building factories, we must implement the principle of designing, constructing and operating antipollution equipment simultaneously with the principal part of new projects.
2. In selecting sites for factories, we must pay attention to open terrain; we should not concentrate on a specific topography. For example, in a small enclosed basin, the topography will frequently slow the movement of air currents, sometimes, the air currents remain in a stationary state, and with the high temperature in industrial zones, the concentration of population, inversion layers and heavy fog easily occur, thus smoke and toxic gases gather without dispersing.
3. We must consider climatic factors. Because of differences in climate, the urban use of land, and urban effects on local climatic characteristics, and microclimates are created and have laid a foundation for creating a rational environment for the distribution of industry. We must pay attention to wind direction. Throughout the year, there is one peak wind direction. The industrial district should be placed downwind and the residential district should be located upwind. In regions where there are two peak wind directions that are basically opposite at 180° throughout the year, and if there is a directly alternating characteristic, the industrial district should be located on the upwind side and the residential district should be located on the downwind side. If there are seasonal rotations, the industrial district should be located on the opposite side of the direction of wind rotation. When considering the direction of the leading wind, clearly zoning the functions of urban land will help create better sanitary environmental conditions for the residential

district. The industrial district, the direction of city streets and the cross section all affect the draft of nearby regions greatly.

4. We should pay attention to protecting water sources. We should locate the industrial district in the downstream region of the city and residential areas and maintain a definite distance from the city. Polluting factories should be strictly prohibited from being built in regions with a dense residential population and in scenic and tourist regions.

5. The distribution of industries should not be over concentrated in large cities. It should be appropriately scattered. In this way, there will be less amounts of the "three industrial wastes", and they can be naturally diluted and purified and treated at the locality.

6. We should pay attention to preventing and controlling noise pollution. Enterprises or shops that produce a lot of noise should be located in concave land. In this way, the sound pressure level of the source of noise can be lowered and propagation over a large area can be avoided. They should not be located on the two banks of small rivers and lakes because the water surface can reflect and intensify noise. Residential areas should be located in the downwind side where there is less noise.

7. We must prevent pollution of the agricultural environment. According to data analysis, heavy metals discharged by smelting factories accumulate in soil and in plants. The content of lead, arsenic, cadmium, and mercury in vegetables and soil drops as the distance from the smelting factory increases. The content of arsenic and cadmium in plants also decreases as the distance from the smelting factory increases. But the content of lead and mercury in plants does not show any relation with the distance from the smelting plant. There is a large accumulation of heavy metals in the surface layer of soil and these heavy metals can be used by the plants. When these numerical values are compared to the "average values" of the content of heavy metals that can deteriorate the soil quality, it shows that these heavy metals are poisonous to some plants.

8. We must green the living areas and factory areas, we must plant trees and create forests, and establish a shelterbelt of necessary width. If each city resident has 10 square meters of forest area and 50 square meters of lawn, the air can be kept fresh constantly. Green plants can absorb carbon and manufacture oxygen, absorb poisons and dust, filter and absorb toxic waste gases, and weaken damage by noise.

Special Factors In the Distribution of Different Enterprises

Steel, Iron and Nonferrous Metals Industries:

The steel and iron, and nonferrous metals industries generally do not have ore washing plants. In arranging the main plant area, the tailings yard and the waste slag yard, we should fully consider the special requirements of each part in selecting the site for the plant.

Ore washing plants usually use a lot of water, release a lot of sewage and smoke, and cause serious pollution for residential living, in water systems, for agriculture, animal husbandry and fisheries. They should be far away from residential districts. The placement of the plant site should be on a mountain slope on the upwind side from the residential area where the wind frequency is the smallest and downstream from the local water source.

Tailings yard and waste slag yard: Low mountain valleys or waste land should be selected for these, or lowland and uncultivated land near the factory area should be utilized. The yards should be outside the factory area, residential points and water supply sources and such sanitary and protected zones, and comprehensive utilization should be considered. When the residential area is located on the downwind side of the plant area where the wind frequency is the smallest and the tailing yards and waste slag yards are placed near rivers, they should be located upstream from the sewage outlet of the enterprise.

Main plant area: This should be in a topographically flat area, it should not be near a glass factory or instruments plant. A lot of waste gas and waste water is discharged which endangers man, agriculture and livestock. We should pay attention to technical reform and strengthen environmental management.

Rare and precious metals smelting plants: Release radioactive substances and hazardous particles and should be far away from residential areas. The site must be surrounded by wide open spaces and be in a flat region with good ventilation. We should avoid building them in low valleys and regions with dead air pockets.

Carbon plants, cement plants: Produce a lot of particulate matter, and they must be far away from urban regions. They must have dust removal and ventilation facilities. The plant site must be in the downwind area and in the lower reaches of rivers and residential areas. The plant sites of enterprises that produce particles of different nature should not be close together to avoid affecting product quality.

Thermoelectric power plants, textile plants, and paper mills: Use a lot of water, and should be near locations with an abundance of water sources. At the same time, they seriously pollute the ground surface and the groundwater. The plant sites should be in the downstream section of rivers and residential areas and they must have purification facilities.

Printing and dyeing plants, and petrochemical plants: Are enterprises that produce especially serious pollution by the "three wastes". The plant sites should be in the upwind area of the city where the wind frequency is the smallest, the lower reaches of rivers and cities, or the outskirts of cities. Petrochemical plants should not be built in depressed regions and stationary wind areas (where the frequency of stationary winds throughout the year is >40 percent) to avoid creating serious pollution due to the inversion layer. There must also be good sewage draining conditions and necessary protective gaps must be established. It would be suitable to establish petrochemical zones far away from urban areas.

Rationally Determine The Composition and Scale of Industrial Districts

On the basis of benefiting environmental protection, enterprises that pollute the environment and discharge similar wastes should be concentrated in an appropriate section in the city to form a closely linked industrial zone. Depending on the scale and the nature of the enterprises, certain enterprises should be separated at a definite distance apart by a health protection zone. Industrial zones should be built in appropriate topography, but should not be over concentrated. If the scale is too large, cross pollution by the "three wastes" from enterprises of different sectors will occur and hazardous substances will condense. They would be difficult to dilute and purify naturally and to treat locally.

Enterprises that will easily lead to secondary pollution should not be located together. For example, hydrocarbons released by oil refineries and nitrogen and oxygen compounds released by nitrogen fertilizer plants can mix and easily produce photochemical smog under conditions of atmospheric temperature inversion, stationary wind and sufficient sunshine.

Some enterprises that produce less amounts of the "three wastes" and less noise can be scattered among residential areas without forming an industrial district.

The industrial district is not the only form of distributing industries. In recent years, foreign nations have proposed the formation of spatially independent communities based on considerations to improve sanitary and recreational environments. Each community has its own cultural, educational, sanitation and commercial facilities. Various recreational grounds are placed between the communities and there are convenient transportation links. As science and technology develop and production technology is reformed, many new forms for the distribution of industrial enterprises will emerge.

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CSO: 5000/4135

DETERMINING WIND-BORNE POLLUTION PATTERNS FOR FUTURE URBAN PLANNING

Beijing HUANJING KEXUE [JOURNAL OF ENVIRONMENTAL SCIENCE] in Chinese No 6, 1982 pp 17-19, 60

[Article by Zhang Jingzhe [1728 2529 0772] and Liu Jihan [0491 4949 7281] of the Geography Department, Beijing University: "Pollution Indices of Wind and Pollution Frequencies by Wind Directions"]

[Excerpts] The Probabilities of Pollution in Each Wind Direction at Beijing, Hohhot and Changsha

We calculated the pollution indices, the probabilities of pollution and the pollution coefficients (Table 6) of each wind direction in 1978 at Beijing, Hohhot and Changsha. To facilitate comparing the strength in each direction and their corresponding change, we converted the frequency of wind direction at each station, the pollution coefficient and the pollution probabilities into percentages, that is, the maximum value in each wind direction was taken as 100, then the corresponding values for the other wind directions were calculated as percentages (Table 7). The data in Table 7 were used to draw the wind rose of ordinary winds at the three stations, the wind rose of pollution coefficients and the wind rose of pollution probabilities.

It can be clearly seen from Tables 6 and 7 that the wind rose of pollution probabilities at the three stations is noticeably different from the wind rose of ordinary winds and the wind rose of pollution coefficients. The latter two have a definite similarity, and are similar to the single peak wind at Changsha. Worth noting is that the pollution probability in the direction where the frequency of wind direction on the ordinary wind rose is large may not necessarily be large but may be small. For example, the frequency of wind direction in the S and SSW directions in Hohhot is large, reaching 78 percent and 67 percent respectively of the maximum frequency wind direction (NW), but the pollution probability in these two directions are not large, only 37 percent and 38 percent of the maximum pollution probability (N). Also, according to the ordinary wind rose for Hohhot in 1978, there are two peak wind directions (NW and S) with not too different wind direction frequencies. The pollution probabilities of the wind direction of N and NW are the most outstanding. The ENE also is not small, and all the pollution probabilities of the southerly directions are small. In addition, the most

frequent wind direction in Hohhot is NW, and the direction of maximum pollution probability is N, the two differ by an angle of 45° (i.e. two directions).

We can also see from the three types of wind rose graphs for Changsha that the pollution probability in the direction with a small wind direction frequency may not necessarily be small, but may possibly be very large. The wind direction frequencies in the NNE and SE directions account for only 21 percent and 32 percent of the maximum wind direction frequency (NNW), but the pollution probabilities in these two directions are respectively 59 percent and 77 percent of the maximum pollution probability (NW). According to the normal wind rose, the NW-NNW wind direction frequency in Changsha in 1978 is especially large (i.e. peak wind), but the wind direction frequencies in the other directions are much smaller. This is a typical single peak wind direction. But among the pollution probabilities of all the wind directions, the pollution probability of the southeasterly wind is not much smaller than that of the northwesterly wind (direction of maximum pollution probability) (the former constitutes 77 percent of the latter), these are two opposite directions with large pollution probabilities.

It can also be seen from the three types of wind rose graphs for Beijing that the pollution probability in the direction with a small wind direction frequency may not necessarily be small. For example, the WSW wind direction frequency accounts for only 36 percent of the frequency of the maximum wind direction NNW.

The pollution probability in this direction accounts for 80 percent of the maximum pollution probability in the NNE direction. Although the wind rose of pollution probability and the normal wind rose for Beijing both have two high values in opposite directions, the two opposing directions (NNE, WSW) of the former and the two opposing directions (NNW, SSW) of the latter have turned an angle of 45° .

The above comparative analysis clearly shows that the wind rose of the pollution probability and the normal wind rose (and the wind rose of the coefficient of pollution) are noticeably different, because the normal wind rose reflects only the one factor of the frequency of wind direction. It does not reflect accurately the conditions leading to atmospheric pollution. Although the wind rose of the coefficient of pollution is based on the frequency of wind direction and wind velocity, other important factors other than wind are not considered. Although it differs from the normal wind rose, the difference is generally not great; therefore, it cannot accurately reflect the conditions leading to atmospheric pollution.

It is generally believed that the smaller the wind velocity the more serious the pollution. But the actual situation is not entirely so. Because when there are other factors that favor the dispersion of pollutants (such as instability of the atmosphere) or when scouring (raining) are present, although the wind velocity is small, the pollution indices may still be small and pollution will not occur. Data in Table 8 forcefully illustrate this point. Therefore, when considering the relationship between atmospheric

Table 6. Frequency of wind direction, pollution coefficient and pollution probability

Location	Wind Direction Item	N	NNE	NE	ENE	E	ESE	SE	SEE	S	SSW	SW	WSW	W	WNW	NW	NNW	C
Beijing	Frequency of wind direction	7	10	4	5	3	5	4	6	6	11	4	4	1	2	3	11	14
	Average wind velocity	3.2	2.4	1.8	2.2	2.3	2.3	2.5	2.5	2.6	3.2	2.9	2.5	2.0	2.6	3.6	5.6	
	Pollution coefficient	2.2	4.2	2.2	2.3	1.3	2.2	1.6	2.4	2.3	3.4	1.4	1.6	0.5	0.8	0.8	2.0	
Hohhot	Pollution probability	7.8	9.9	5.9	6.0	3.2	5.1	5.3	6.6	5.2	7.5	6.4	7.9	3.0	3.7	5.1	8.0	
	Frequency of wind direction	5	3	3	3	3	3	2	5	7	6	3	1	1	2	9	6	40
	Average wind velocity	2.6	1.8	1.7	1.7	1.8	2.3	2.2	3.1	3.6	4.6	3.2	2.1	3.2	3.5	4.2	4.0	
Changsha	Pollution coefficient	1.9	1.7	1.8	1.8	1.7	1.3	0.9	1.6	1.9	1.3	0.9	0.5	0.3	0.6	2.1	1.5	
	Pollution probability	14.9	7.6	7.9	7.4	5.1	3.6	3.1	3.8	5.5	5.6	3.6	2.5	1.4	4.1	13.5	8.3	
	Frequency of wind direction	8	4	2	1	2	2	6	8	4	2	2	1	1	2	18	19	19
Changsha	Average wind velocity	3.7	3.1	2.3	2.3	2.3	2.5	2.2	2.8	3.6	3.4	2.9	2.3	2.9	2.9	3.7	3.9	
	Pollution coefficient	2.2	1.3	0.9	0.4	0.9	0.8	2.7	2.9	1.1	0.9	0.7	0.4	0.3	0.7	4.9	4.9	
	Pollution probability	8.2	9.9	2.6	2.4	1.8	4.0	12.9	9.7	3.9	3.7	1.8	1.0	1.1	4.8	16.7	15.6	

Table 7. Percentages of frequency of wind direction, pollution coefficient and pollution probability

Location	Wind Direction Item	N	NWE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Beijing	Frequency of wind direction	64	91	36	45	27	45	36	55	55	100	36	36	9	18	27	100
	Pollution coefficient	52	100	52	55	21	52	38	57	55	81	33	38	12	19	19	48
	Pollution probability	79	100	60	61	32	52	54	67	53	76	65	80	30	37	52	81
Hohhot	Frequency of wind direction	56	33	33	33	33	33	22	56	78	67	33	11	11	22	100	67
	Pollution coefficient	90	81	86	86	81	62	43	76	90	62	43	24	14	29	100	71
	Pollution probability	100	52	53	63	34	24	21	26	37	38	24	17	9	28	91	56
Changsha	Frequency of wind direction	42	21	11	5	11	11	32	42	21	11	11	5	5	11	95	100
	Pollution coefficient	45	27	18	8	18	16	55	59	22	18	14	8	6	14	100	100
	Pollution probability	49	59	16	14	11	24	77	58	23	22	11	6	7	29	100	93

pollution and wind, we must also consider the other important factors related to atmospheric pollution. This is the advantage of this article which has used the pollution indices of wind and the pollution probability of each wind direction calculated according to the pollution indices.

Table 8. Values of two pollution indices in 1978 in Hohhot

Item	Time	
	1 August 1400 hours	22 July 2000 hours
Wind direction	S	NW
Wind velocity	1	1
Amount of clouds	0	10
Rainfall	0	1.8
S.	1	4
P	1	0.3
u	1	1
h	6	4.5
l	0.17	0.27

III. Conclusion

The two formulas for calculating the pollution index of wind and the pollution probability proposed in this article are simple. The purpose is to allow urban planners to easily calculate needed data from a part of the material taken from records of ground surface meteorological observations and measurements by meteorological observatories and stations, and to draw the wind rose for pollution probabilities. When used in urban planning, the conclusions from data over 10 to 20 years or an even longer period are more reliable. This article has used data for only 1 year for analysis. The purpose is to explain the visible difference between the normal wind rose and the wind rose of the pollution probability proposed in this article; therefore, the use of the normal wind rose as reference for urban industrial distribution may not realize the goal of preventing or reducing atmospheric pollution.

Finally, we should point out that the results calculated according to the methods proposed in this article can only be used for the general urban plan as a basis for distributing industries. It cannot be used as a basis for planning factory areas. The area of a factory is much smaller than the area of a city. Both are two types of spaces of different dimensions. The winds of the same type of weather do not create entirely the same atmospheric pollution in the atmosphere near the ground surface within spaces of different dimensions. Sometimes, the results are very different. The effect of wind of atmospheric pollution in factory areas is another research subject that goes beyond the scope of this article.

MEASURES TO PREVENT CONTAMINATION, POLLUTION OF SEWAGE IRRIGATION, BENEFICIAL USES OUTLINED

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 7, 1982 pp 9-11

[Article by Sun Shulin [1327 1065 2651]: "A Discussion on Urban Sewage Treatment Systems Engineering"]

[Text] Urban sewage treatment systems engineering is a general term that refers to the origin and development of sewage as a whole, a system, i.e., the series of engineering measures that uses the energy, and the resources of urban sewage to the maximum degree and the purification of sewage. It includes the three major subsystems of pretreatment of sewage by units releasing the sewage, transportation, and centralized purification of sewage. In studying and determining the engineering measures for a certain subsystem, we must take care of the relationship between it and another subsystem. We must follow the engineering goals of the whole system to make the best design, carry out the best construction, use the best management, and obtain the best economic benefits and environmental results.

Pretreatment refers to the full utilization of all retrievable and usable energy and resources by strengthening management of the units discharging wastes and measures to renovate technology. The concentration of heavy metals and organic substances that are difficult to decompose, and pathogenic microorganisms in the sewage must meet the effluent standard. At the same time, we must emphasize water conservation, separate the flow of clean water and sewage, retrieve and utilize sewage, and carry out closed circulation so as to reduce the amount of sewage released as much as possible. Sewage that has been pretreated must satisfy the effluent standards for water quality and quantity before it is drained into the underground network of sewage pipes of the city.

The method of centralized purification should be based on the natural environment of the locality and hydrogeological conditions, measures must be suited to local conditions. Some have built oxidation ponds, others have built primary and secondary treatment plants. But in most of the regions of China, it is more suitable to carry out soil purification -- sewage irrigation. Sewage irrigation is not an old concept. It is planned irrigation over a large area and constant rotational irrigation that take into full consideration the quality and quantity of urban sewage, and full consideration of agriculture, forestry,

water and soil factors in the region irrigated by sewage. We must establish special management agencies to conduct scientific management to realize the three goals of purifying the city's sewage, using water and fertilizers to support agriculture and forestry, and guaranteeing that water, soil and food grain crops are not polluted.

This is city sewage treatment systems engineering that includes the series of engineering measures of extracting water, using water, draining water and sewage purification.

The implementation of urban sewage treatment systems engineering to replace the singular effort of investing large funds to build primary and secondary sewage treatment plants to purify urban sewage is a new endeavor to shatter the stagnant situation of spending a lot of money on sewage treatment but realizing few gains over many years, and it is a new endeavor to realize new progress in the treatment of sewage and at the same time to realize better environmental and economic results. It is a new endeavor to solve the shortage of water sources and pollution. This is entirely suited to our nation's situation.

If we use the method of soil purification -- sewage irrigation to treat urban sewage, we must first use the procedures of systems engineering to fully understand the origin and the development of sewage in the city, the ward and the river valley, consider the question on an overall basis, use theoretical calculations, monitoring and simulated experiments to understand the properties and quantity of sewage of every unit, changes in sewage after it flows into the underground sewage channels, the pattern of emergence and disappearance of toxic substances, and the agricultural, forest, water and soil conditions in the regions irrigated by sewage, and in particular, the self-purifying ability of soil and bodies of water of the locality so as to establish a systems engineering plan for irrigation using sewage and to carry out the work of purifying and treating urban sewage.

What are the benefits of using soil purification to treat urban sewage?

1. This method can replace primary and secondary sewage treatment plants, conserve a lot of capital construction investment and operating costs. For example, according to estimates by designing departments, the three cities of Zhengzhou, Jiaozuo and Xinxiang at least can save a one-time capital construction investment of 140 million yuan. Each year, they can save 6.5 million yuan in operating cost (not including the cost of treating sludge). At the same time, sewage irrigation can prevent direct contact between urban sewage and natural bodies of water, and reduce the chance of polluting the bodies of water.

2. This method can provide many sources of fertilizers for agriculture. The sewage pipelines in the eastern suburbs of Zhengzhou City drain 60,000 tons of urban sewage a day. Chemical analysis shows that the nitrogen content is 50 ppm, the phosphorus content is 23.5 ppm, the potassium content is 0.25 ppm, etc. According to reports, if we take nitrogen for our calculation, the content of fertilizers in 50 tons of sewage irrigated in each mu of wheat is equivalent to 30 jin of ammonium carbonate, and this can increase the yield of wheat by 75 jin. Compared to the application of chemical fertilizers, a saving

of 4.24 yuan in cost can be realized per mu of wheat. Thus, 60,000 tons of sewage can irrigate 1,200 mu of farmland and can produce an increased yield of 90,000 jin of wheat at a savings of 5,088 yuan in cost. Obviously, the use of urban sewage to irrigate farmland has great potential to increase agricultural yields.

3. Sewage irrigation can return a lot of groundwater. This can prevent and reduce the drying up of water sources, a drop in the groundwater level, and sinking of the ground surface.

4. Using urban sewage to irrigate farmland can improve climate and soil. Using urban sewage for large area and constant rotational irrigation, especially during arid seasons, and diverting sewage to irrigate barren land, saline and alkaline land and desert land can guard against winds and stabilize sand, wash away salinity and suppress alkalinity. At the same time, the large amount of organic substances in sewage can improve the soil's granular structure. This can loosen soil that easily becomes hardened. This can agglomerate "the expanse of loose sand", form granular structures, and benefit the growth of crops.

How should we treat and solve the side effects of using urban sewage to irrigate farmland?

The main side effect of using sewage for irrigation is the pollution of water, soil and grain (including other agricultural crops). This is the key problem in developing sewage irrigation. We should see that the cause of pollution in individual areas is mainly poor management. According to surveys, all acute or chronic and cumulative damage caused in some areas by sewage irrigation has been due to the use of high concentrations and large amounts of sewage, without plan, and year after year over a small area of soil or it is due to individual accidents. If we use the methods of systems engineering to plan sewage irrigation in low concentrations (meeting water quality standards for irrigation), appropriate amounts of sewage, carry it out according to plan over many years in rotation over large areas of land and fully utilize the soils' purifying ability, damage by pollution would not be created. Several opinions on how to treat and prevent pollution in some areas created by the use of sewage irrigation are discussed:

First, we must eliminate ideological worries, boldly and scientifically develop sewage irrigation. Every locality in the nation has concrete examples of large area and long-term sewage irrigation without causing damage. For example, the suburban region of Zhengzhou City has a 20-year history of sewage irrigation. There has not been any visible accumulation of toxic substances on the 90,000 mu of land irrigated with sewage. The environmental protection monitoring station of Zhengzhou City and other units conducted chemical analysis of 22 wheat samples and 32 soil samples in 1978 and 1979. The results showed that the contents of mercury, lead and chromium have not surpassed state standards. Sewage irrigation throughout the nation as a whole will not pollute water and soil as long as we strengthen management, stop the occurrence of bold and rash ventures and carry out sewage irrigation scientifically.

Second, the units discharging wastes should be responsible for limiting and reducing the concentration of pollutants in the sewage released, and strengthen pretreatment. The main way is to strengthen management, renovate technology, and develop comprehensive utilization to fully retrieve energy resources. This can conserve the use of water and other raw materials, recover large quantities of useful materials, and avoid contamination of the areas irrigated with sewage and pollution of natural bodies of water. This can be carried out in combination with the principle of "whoever pollutes should treat the pollution" established by the state and the "Regulations for Levying Pollution Fees".

Third, pretreatment must pay attention to major conflicts. We must concentrate on the heavy metals and toxic substances that are difficult to decompose in sewage. We must do this work well, otherwise we will not obtain the expected results.

Fourth, agriculture, forestry, hydraulic power, urban construction, environmental protection and other concerned economic sectors must be coordinated and act consistently. A management agency for sewage irrigation must be established and systems engineering plans for purification of urban sewage for soil must be drawn up. Scientific management must be strengthened to expand the area of sewage irrigation to several dozen li and several hundred li. This can avoid the occurrence of saturation of the "five poisons" on local and nearby fields irrigated with sewage and eliminate the worry of polluting water, soil and grain.

Fifth, we must prevent leakage. Contamination of the ground surface of sewage irrigated areas and pollution of groundwater are caused by the direct "encounter" of natural bodies of water with leakage from sewers or leakage from the ground irrigated with sewage and with surplus water and receding water. The way to prevent leakage is to transport sewage in the city limits in underground pipes and not to use exposed canals. Trunk pipelines for water drainage outside the city must be protected by an anti-leakage layer. The fields to be irrigated must be leveled to prevent localized accumulation of water or running water. Irrigation of land that easily leaks must be appropriate. We must combine sewage and clean water for irrigation, etc. For example, over 60,000 tons of sewage pass through 40,000 mu of land near the Dongcheng Ward in Zhengzhou City every day. Surplus water and receding water first enter Dongfeng Canal then flow into the Huai He, polluting the river. If we apply systems engineering methods and use the several dozen thousand tons of sewage to irrigate nearby farmland and transfer most of the sewage to the more remote suburbs in Zhongmu County to irrigate the several hundred thousand mu of cultivated land, desert land and saline and alkaline land, after being fully purified by the soil, sewage that flows into the river channel will not create pollution. According to reports, Beijing is a good example. The sewage of the Capital Steel Company located at Shijingshan west of Beijing originally was used to irrigate a small area of cultivated land of the nearby Shijingshan Commune. The land easily "consumed" 4,000 tons of water per mu, causing serious contamination of the soil and the groundwater by phenol and cyanogen. Later, with the cooperation of concerned departments, the sewage of Capital Steel was transferred to the Qingyundian and Huangtugang Communes in Daxing County several hundred li

away to irrigate several dozen thousand mu of cultivated land and desert land that have the ability to resist leakage. This not only prevented the pollution of water, soil and grain, it also improved the soil texture of desert land and guaranteed good agricultural harvests. Without the cooperation of concerned departments, such "transfer of water from the west to the south" could not be done.

At the same time, we should emphatically point out that using urban sewage to irrigate land does not necessarily require building additional canals. We can dredge the original network of clean water irrigation canals to prevent sewage from flowing back into the rivers, reservoirs and wells. We can mix clean water and sewage for irrigation, and carry out rotational irrigation by alternating the use of clean water and sewage. We can perfect sewage irrigation by taking actual conditions into consideration.

To improve urban sewage for irrigation, we must pay special attention to two standards and one organization. We must first pay attention to the plants, mining enterprises and other discharging units so that the sewage being discharged will meet the effluent standards. The second is to pay attention to agriculture, forestry and water. We must never allow sewage that does not meet the water quality standards for irrigation to enter the land. These are the so-called two standards -- effluent standards and sewage irrigation standards. The other is organization. We must organize agriculture, forestry, water conservancy, urban construction and environmental protection and other concerned sectors to participate, organize sewage irrigation leading groups or administrative committees to uniformly lead the work, divide the work and cooperate with each other. We must establish scientific irrigation plans and management rules, and we must establish special management agencies, assign an appropriate number of special personnel to be responsible for concrete monitoring, inspection and management work so that the use of urban sewage for irrigation can be done even better!

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CSO: 5000/4073

STUDIES ON URBAN RUNOFF TO BE USED TO DRAW UP REGIONAL POLLUTION STANDARDS

Dalian HUANJING KEXUE XUEBAO /ACTA SCIENTIAE CIRCUMSTANTIAE/ in Chinese No 4, Dec 82 pp 271-277

/Article by Xia Qing /1115 7230/ of the Chinese Environmental Sciences Research Academy: "A Study on the Pollution System of Urban Runoff"

/Excerpts/ World progress up to the present time has made it necessary for people to conquer the deterioration of environmental quality brought about by their own activities. It has become necessary for them to understand the many imperfections brought about by urbanization and industrialization. The study of runoff pollution from rain in cities reflects this need. Such a topic reflects the characteristics of modern environment, promotes the development of related disciplines, has practical engineering significance, and it must examine the effects of urbanization on each link of the water cycle: for example, the effects of urbanization on rainfall and runoff; the characteristics of showers, ground surface accumulation, scouring by runoff; management of urban runoff from torrential rain and plans to protect water sources, etc. The new fields of urban climatology, urban hydrology, water quality planning are the foundations to solve the problems described above. The need in studying the problem of pollution by urban runoff will also promote the development of these new fields. Along with the study of plans for scientific management of urban runoff from torrential rain, new subject matter will be added to the traditional ideas of urban land utilization and planning and the theory in designing drainage pipelines. We must progress from simply considering the quantity of rain water to be discharged to placing equal emphasis on both the quantity and quality of water.

The method of systems analysis is an effective method to solve this type of multidisciplinary problems that are strongly comprehensive and that involve many influential factors. This article is a preliminary attempt to actually apply this method. Its purpose is to find a practical and feasible way to study runoff pollution in the nation's cities.

Conceptualization of the Real System

We conceptualize the four links in the real and natural process of rainfall--runoff as a system: rainfall--runoff--ground surface scouring--deterioration of quality of the receiving body of water. The goal is to find a schematic simulation curve of pollution of water quality by runoff of the receiving body of water, as illustrated in Figure 1.

The composition of this system possess the basic conditions for systems analysis:

1. The goal is to find the requirements for the water quality of the receiving body of water, and there are general criteria for judging whether the system's goals are good or bad.
2. Many plans to realize the system's goals can be selected, i.e., plans to control pollution by point and nonpoint sources and plans to manage runoff from torrential rain.
3. The individual components of the system can be mathematically modeled for analysis and proof, i.e., a model can be established on the transport of pollutants.
4. The system easily satisfies the independence requirement.

We take rainfall as the input of the system. The selection of the designed frequency of torrential rain will determine the amount of rainfall, and thus affect the concentration of pollution by runoff, therefore, the designed incidence of torrential rain determined by the designed frequency is the first step in the conceptualization of the system.

The derivation of the amount of urban runoff follows the method of the derivation formula stipulated in China's design standards for drainage. To make it easy to combine the standards with engineering designs, the derivation formula is also used to calculate the amount of runoff in order to derive the maximum amount of surface scouring. At the same time, based on the modular rain type controlled by the same frequency, the duration of rainfall is not limited. Let the runoff area increase evenly with duration of rainfall, then we can derive the flow curve of runoff and use it to establish the function of pollution released by a ground surface source. This is the second step in conceptualization.

Ground surface debris on city streets is the source of runoff pollution, and it is another input of the system. It is represented by solids easily swept away and moved. Quantitative expressions for the rate of accumulation, the rate of scouring of ground surface, the rate of runoff scouring and such variables can be established. Then, we derive the total amount of pollutants entering the waterflow from the amounts of various types of pollutants contained in solids as the third step.

The fourth step is to study the pattern of variation in water quality under the influence of point source and nonpoint source pollutants in the receiving body of water. This pattern is then simulated by a model.

Finally, the environmental quality requirements for regional water is determined according to the purpose of use of the area's water region, and we derive the allowable amounts of pollutants to be released by point sources and nonpoint sources as the bases for drawing up plans to control urban runoff from torrential rain and water quality management plans.

It is obvious that the standards for evaluating runoff pollution, control measures, and management methods are all dictated by the capacity of the water environment of the local receiving body of water. Therefore, because of differences in time, space and regionality, the study of runoff from rainfall will not yield a uniform result. It will only provide a general and conceptualized conclusion suiting vastly different regional characteristics. The important thing is to use these conclusions by combining them with concrete conditions.

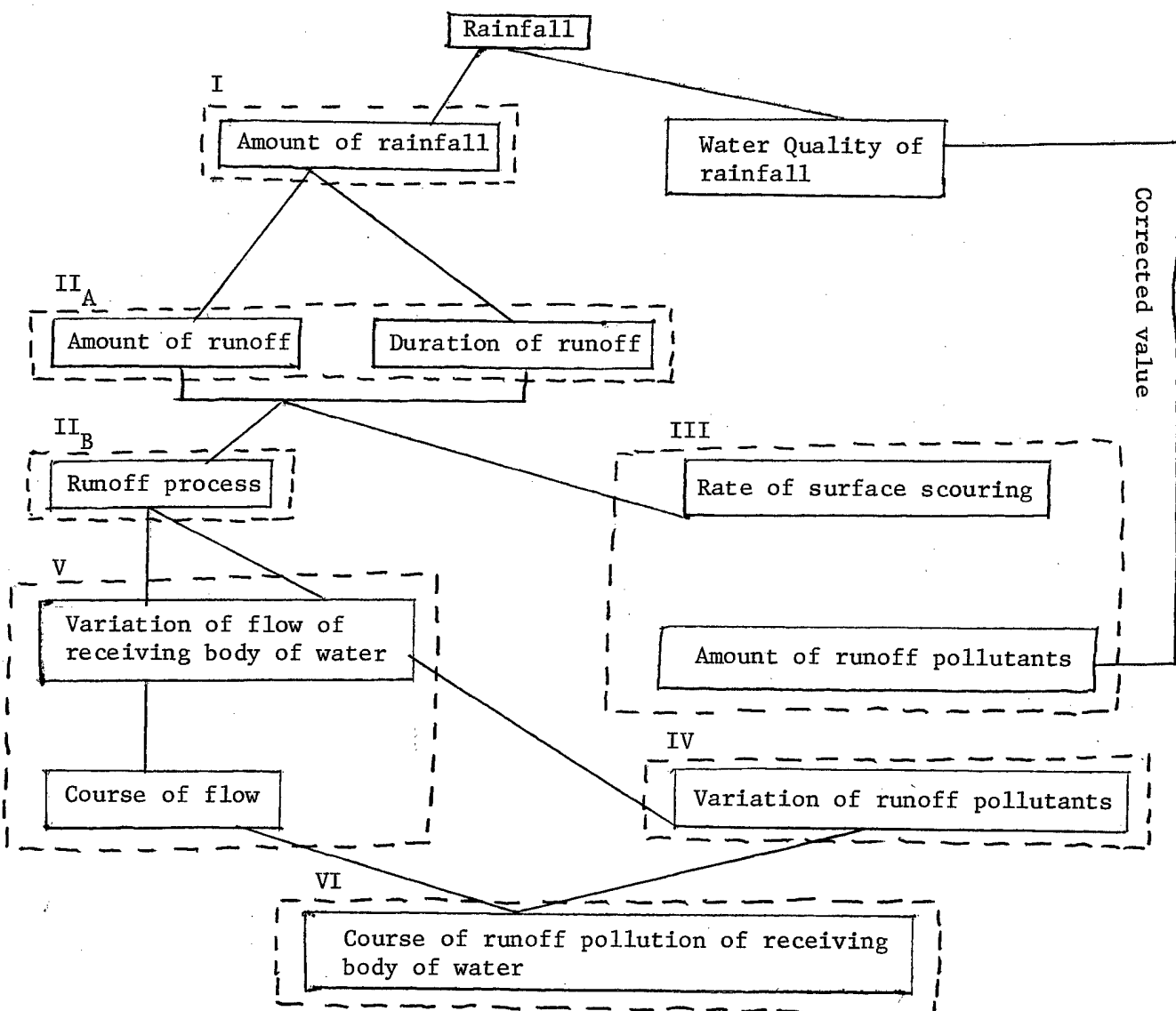


Figure 1. Analytical scheme of the urban precipitation-runoff system

Actual Measurement and Simulation of Urban Runoff Pollution

To further prove the estimated conclusion of the polluting sources of urban runoff, simultaneous observations of water quality and quantity of rainfall were conducted at the Lejiahuayuan Hydrological Station over the Tonghui He in Beijing. Records of 8 August 1980, were used as an example (Table 4, Figure 2)

Station name	Location	Starting and ending time of rain	Duration of rain (hr)	Amount of rain (mm)
Tiananmen	city center	13:35-14:20	0.75	56.4
Lejiahuayuan	city east	13:35-14:20	0.75	15.3
Songlinzha	city north	13:25-14:20	0.92	30.5
Yuyuantan	city west	none	none	none

Quantitative regression from the curves for quantity of water and water quality to prove the percentage of runoff pollution involves the following difficulties:

1. It is difficult to differentiate between runoff pollutants and suspended pollutants in the waterflow in the scouring river channel.
2. Because of urbanization, rainfall is uneven, and there is no way to discern the course of genesis of waterflow from the quantitative information of waterflow.
3. The urban sewage system combines many different water collecting areas, and the distance from the main discharge point varies, and the course of confluence is complex.
4. The rate of accumulation of surface debris in each functional region of the city, the rate of scouring by runoff, and the composition of pollutants are all different.

Therefore, we can only obtain a qualitative conclusion from actually measured results: Urban runoff pollution will cause the water quality to worsen within a short time after raining. For example, the BOD₅ in Tonghui He on 8 August rose to a maximum of 70.32 mg/l(14:45), and by 19:00 it dropped to 16 mg/l.

Analysis of simulated results:

1. The line connecting the maximum values of the BOD curves for each Δt interval generally decreases progressively according to $100 \cdot e^{-0.2t}$. At about 30 kilometers downstream from the city, the incremental value of the BOD index brought about by urban runoff can attenuate to about 5 mg/l, therefore, the area of serious organic pollution by urban runoff is limited.

2. As the duration lengthens, runoff pollutants disperse in the course of being transported downstream. The BOD curves corresponding to each Δt interval gradually flatten out, the peak value drops, and the affected area expands. For example, near the city's discharge point, the incremental value of BOD caused by runoff pollution remains above 5 mg/l for only about 2 hours. At 5 kilometers downstream from the city's discharge point, it remains for about 3.75 hours. At 10 kilometers downstream from the city's discharge point, it remains for about 4.5 hours. Therefore, in the area within 30 kilometers downstream from the city's discharge point, the duration of the incremental value of BOD will lengthen as distance lengthens. This shows that in water regions where the requirements for water quality is higher and where present conditions are better, the effect of one runoff pollution is worth noting. It has the same pattern as the actually measures results in Tonghui He.

Conclusion

Since the 1960's, the problem of urban runoff pollution has attracted more and more attention. Foreign nations have conducted massive research in the problems of storing rain water, underground draining of runoff, storing runoff rain water in pipes to temporarily reduce the peak and even using physical and chemical methods to treat runoff rain water. This has caused a new change in water drainage engineering designs, such as using urban runoff flow lines, reducing the number of grids, establishing new land utilization plans. The prevention and control of runoff pollution have thus become important tasks in urban administration.

China does not possess conditions for utilizing water treatment plants to control urban rain water pollution. But when drawing up water quality control plans at each locality, runoff pollution must be emphasized. This is because, 1. runoff pollution varies at different localities, and concrete analysis and evaluation must be done; 2. laying pipelines requires planning beforehand, and remedial measures are difficult and costly; 3. the solution to the problem of runoff pollution requires a careful study of the water quality of the receiving body of water. Therefore, in our nation with a large expanse and varied climate, it is not appropriate to uniformly use a system of separate flow pipelines to drain runoff. We need to concretely study the whole series of questions concerning the quantity and quality of runoff from rainfall in the city under discussion, the water quality goals of the receiving body of water and the environmental capacity, urban land utilization plans, the ratio between point and nonpoint source pollutants and whether we should lay rain water pipelines to establish a good foundation for treating rain water in the future. Then we should combine these with cost versus gain analysis and finally select a system of separate flow pipelines, a system of combined flow or a system of combined flow with flow intercepting pipes.

At present, our nation is about to launch the work of drawing up regional pollution standards, and thus paying attention to nonpoint source pollution has a more practical significance.

The problem of preventing and controlling pollution is, by nature, a problem of resource management. We can only effectively prevent and control water pollution

by comprehensively considering urban water supply, urban drainage, land utilization plans, protection of water sources, and utilization of water conservancy resources, and by studying urban administrative planning and hydrological observation as a mutually linked system.

Because China's economic foundation is still very weak, present efforts to prevent and control water pollution are limited in industrially concentrated and densely populated regions, i.e., bodies of water near cities and towns closely linked with human life. This determines that plans for the prevention and control of regional pollution centered around cities should be included as an important subject in China's environmental studies, and the study of urban runoff is the main content of plans to prevent and control regional pollution. Developing research in this subject requires scientific and technical workers in environmental science, water conservancy and urban administration to carry out the work together.

This work was done under the guidance of professor Liu Peitong /0491 1014 2717/ and assistant professor Wang Huadong /3769 5478 2639/, and it was guided many times by researcher Shen Baocheng /3947 5508 6134/, professor Tang Yongluan /0781 3057 7019/, assistant professor Guan Boren /7070 0130 0088/ and assistant professor Li Xianwen /2621 3759 2429/. The Laboratory of the Beijing Urban Administration Design Academy and the Soil and Fertilizer Station in Tongxian helped conduct chemical analysis of water and soil samples.

9296

CSO: 5000/4124

FIGHT INDUSTRIAL POLLUTION THROUGH TECHNICAL TRANSFORMATION

Beijing ZHONGGUO FAZHI BAO in Chinese 25 Feb 83 p 1

[Article: "The State Council Makes Several Regulations: Combine Technical Transformation To Prevent Industrial Pollution"]

[Text] The State Council has recently made several regulations on combining technical transformation to prevent industrial pollution.

The regulations point out that industrial pollution is the main cause of environmental pollution. To further eliminate pollution, protect the environment, promote production, increase economic benefits, and organically combine and carry out the treatment of the three wastes, comprehensive utilization, and technical transformation, the State Council has stipulated that when we make technical transformation in industries and enterprises we should regard the prevention of industrial pollution as an important task and eliminate pollutants in the production process. When industrial enterprises and supervisory departments formulate plans for technical transformation, they must incorporate requirements and technical steps for preventing pollution. The plan for technical transformation must be in accord with the principle of unifying economic and environmental benefits. All industrial enterprises must closely combine technical transformation and carry out comprehensive utilization of wastes. The state has implemented a policy to reward plants, mines and enterprises that carry out comprehensive utilization and the prevention and control of pollution. When conducting technical transformation in enterprises with serious pollution problems, economic commissions at all levels and concerned industrial departments in charge must actively organize and build cooperative centers for trade specialization. In combining technical transformation, the needed funds for engineering projects to prevent pollution and their complete purification and treatment facilities should be centrally included in enterprise, local or state plans. When formulating or revising the quality standards of various commodities in mining materials and fuels, state economic commissions and departments of industrial mining and fuels must give full consideration to the demands of preventing environmental pollution and propose quality standards for commodities relating to the environment. All industrial and supervisory departments should take aim at today's most glaring pollution problems, and make key technology to prevent and control pollution a major subject for research.

The State Council also has stipulated that to successfully protect the environment through technical transformation we must stress both control and management. We should clearly define the responsibility of enterprises and workers to society and to the enterprise respectively in environmental protection. In accordance with the principle of combining responsibility, authority and benefits, we must combine the economic benefits of workshops, teams and groups, and staff workers with those of environmental management by enterprises, as a condition for evaluation, rewards and penalties.

9586

CSO: 5000/4159

HIGHLIGHTS OF ENVIRONMENTAL SCIENCES SOCIETY MEETING REPORTED

Beijing ZHONGGUO HUANJING KEXUE [ENVIRONMENTAL SCIENCES IN CHINA] in Chinese No 2, 1983 pp 78-80

[Article: "Summary of Minutes of the Fourth Session of the First Enlarged Meeting of the Council Standing Committee of the Chinese Environmental Sciences Society"]

[Text] The Fourth Session of the First Enlarged Meeting of the Council Standing Committee of the Chinese Environmental Sciences Society was held in Beijing from 26 to 28 January 1983. Council Standing Committee members attending the meeting numbered 27, and there were 11 comrades from various branch societies and special committees. The council's deputy director, Comrade Li Su [2621 5685], presided over the session, and Ministry of Urban and Rural Construction and Environmental Protection deputy minister, Comrade Dai Nianci [2071 1819 1964] attended the meeting. Environmental Protection Bureau director, Comrade Qu Geping [2575 2706 1627] delivered a report to the meeting on the shape of China's environmental protection work, its strategic objectives, and principal measures.

The principal content of the meeting was as follows: Report back on work of the society in 1982, and consideration of the society's report on contributions in initiating a new situation in environmental protection. The report gave an account of a work symposium organized by the China Science Society, and ideas on preparations for the convening of the Second Congress of members of the Chinese Environmental Sciences Society. The meeting considered academic exchanges, popularization of science, education, and plans for editorial and publications work during 1983, and heard a report on the status of launching an environmental science and technology consulting service. Attendees at the meeting engaged in vigorous discussion. They unanimously agreed that in the 4 years since its founding the society has done a large amount of work, and has had specific achievements in advancing China's environmental protection work, in launching environmental science endeavors, and in popularizing and upgrading the level of knowledge of environmental sciences. The director of the council and concurrent council secretary Comrade Chen Xiping's [7115 6007 1627], report titled, "Unite and Organize Farflung Environmental Scientific and Technical Workers to Make New Contributions in Initiating a New Situation in Environmental Protection," his guiding ideas and principles, and the emphasis of his work were all correct. The society is

fully able to make the most of its strengths in being able to cut across academic disciplines and sectors and in having a galaxy of talent to make needed contributions in formulating for the country important policies to derive economic benefits from technology and to organize the tackling of major difficult scientific and technical problems. The society's work shows bright prospects in the all-around initiation of a new situation in the building of socialist modernization.

Comrades attending the meeting made some specific proposals concerning the work of the society as follows:

First is the need to take in hand strategic problems. The real problem being faced today is what environmental protection is to do in quadrupling the gross output value of industry and agriculture by the year 2000. This is a major strategic problem. The society should organize experts to make scientific forecasts on the basis of wideranging survey. Only when forecasts are at hand is it possible to formulate strategic objectives, the strategic focus, and strategic measures. The environmental protection work goal proposed in the past of "control within 5 years and virtual solution in 10 years" lacks scientific backing; consequently this goal is hard to achieve. Last year, in order to formulate a plan for the management of national land, the State Statistical Committee's National Land Bureau called upon five societies to jointly organize experts concerned to discuss strategy for renovating the country's land. Numerous noted experts put forward valuable suggestions based on long experience in scientific research for the country's consideration in formulating national land strategic plans. Such methods deserve to be encouraged. They both make use of the role of experts and serve the country in the formulation of policies.

Determining the strategic focus and measures on the basis of scientific forecasts. The society must closely correlate its work to the country's real environmental problems, actively participate in comprehensive prevention and control at the Shanxi energy base, in the Beijing-Tianjin-Tangshan area, in Shenyang, and in Changzhou, and launch research on difficult key problems such as the contributions environmental techniques can make to economic policies and economic effectiveness, and participate in the evaluation of environmental effects of major engineering projects. It should act in the Central Committee spirit of reform, demolish old conventions, link up with all policies and measures for economic restructuring, resolutely summarize and promote advanced experiences, suggest new ways of doing things, and gradually take the path of China's own control over environmental pollution and ecological damage, rational development of resources and energy for use, economic development and environmental protection advancing together in step for coordinated development.

Second is strengthening of all-around analytical study of environmental problems. Many areas, sectors, and scientific research units in China have organized manpower to do quite a bit of investigation, research, and experimental work from which they have accumulated data. However, these

data have not been used well and should be analyzed and studied. Reportedly American environmental protection units annually spend large sums on all-around analysis, but China today has no special unit for carrying out such study. This is our weak link. The society should make the most of horizontal liaison and make up its mind to organize forces in all quarters for comprehensive analytical study of existing data and come to scientific, analytical conclusions in keeping with objective realities. For example, atmospheric pollution is very serious in numerous Chinese cities. However, views are by no means the same about either the seriousness of atmospheric pollution or the main causes for pollution. This problem requires organization of manpower to process, collate, flush out, analyze, and study in a comprehensive way existing monitoring data to provide policy making departments data in keeping with objective realities. Acid rain is another problem. Monitoring shows the occurrence of acid rain in many cities. China consumes large quantities of coal, and this problem should arouse sufficiently serious interest. However, pH values derived from testing in some places are extremely low and further authentication is required. Because current methods for measuring acid rain are by no means completely accurate, it is recommended that the society organize survey teams on this sensitive issue to conduct comprehensive survey of sampling devices used, testing methods, and environmental conditions, and organize research on the mechanisms of acid rain to reach precise scientific conclusions. The society can play a greater role in this regard.

Numerous comrades have suggested that good all around analytical study and upgrading of the level of China's scientific research will require strengthening of environmental monitoring and environmental intelligence research work.

Third is organization of numerous academic disciplines for a concerted attack on key problems. Environmental science is a composite science that involves not only numerous basic branches of learning in the natural sciences plus engineering techniques, but also bears on sociology, economics, and law. Individual branches of learning intersect and intertwine. Consequently, in the future the society should better organize numerous branches of learning to carry out integrated academic activities. In solving real problems in environmental protection, it should also rely on and arouse forces in all sectors for vigorous cooperation, and organize concerted multi-discipline attacks on problems. In the realm of pollution control techniques, an interrelated path of ecology engineering and technical engineering has come into being now; in the study of ecological economics, ecologists and economists cooperate; in the evaluation of environmental effects, ecologists and medical experts participate together with economists. These are all inevitable trends in the development of academic research and practical work. The society should guide action adroitly according to circumstances, actively organize research that transcends individual sectors, and give impetus to development of environmental science.

Fourth is needed emphasis on environmental education. Education is the strategic emphasis for bringing about modernization. Environmental problems are new problems that relate to the personal well-being of every individual, so it is all the more necessary to strive to raise the level of scientific knowledge about environmental protection among all nationalities. Right now, emphasis is particularly required on the spread of environmental education among economic departments to raise the awareness of leaders at all levels in the economic sector concerning environmental protection for a synthesis of socio-economic benefits and environmental benefits, and conscious solution to environmental problems concurrent with development of the economy.

Following discussion and study, the enlarged meeting of the Council Standing Committee made the following resolutions on pertinent matters.

First, the conference agreed in principle with Comrade Chen Xiping's report titled, "Unite and Organize Farflung Environmental Scientific and Technical Workers to Make New Contributions in Initiating a New Situation in Environmental Protection." It also agreed in principle with the report on the society's work during 1982 from the society's office, and called upon all members to strive in their own individual positions to act in accordance with requirements of the "Sixth Five-Year Plan," and the overall objectives and strategic tasks of environmental protection in order to make greater contributions to the all-around initiation of a new situation in environmental protection.

Second, the conference agreed that the tenth anniversary of the beginning of environmental protection work, and the fourth anniversary of the founding of the Environmental Sciences Society in the fourth quarter of 1983 would be a good time to hold the Second Congress of society members. The principal content of that congress should be a summarization of the society's work, deciding the society's future work programs and tasks, revision of the society's charter, and selection of a new council. The secretary was asked to form a preparatory group for convening of the second congress, to conduct investigation and study, and to make full preparations. Specific plans pertaining to convening of the second congress would be preliminarily ironed out through discussion and decision of the council's standing committee in a meeting during June 1983. Since the Environmental Sciences Society contains numerous disciplines, numerous sectors, and is comprehensive in nature, it was generally envisioned that the next council meeting would be maintained at the same size as this one, i.e. no more than 120 people. In the re-election of a council, one-third of the members should be replaced. The proportion of middle age and young scientific and technical workers in the council should be no less than 30 percent in reflection of the principle of cooperation and replacement among the young and the old. Re-election of the new council can be done by mail. The foregoing ideas should be implemented only following agreement by the Chinese Science Society.

Third, it was agreed that the already established environmental Science and Technology Consultation Work Committee and the Special Committee for Urban Appearance and Environmental Sanitation should await a report back from the Chinese Science Society before beginning their work.

Fourth, the conference decided to initiate environmental science and technology consulting services. Scientific and technical consulting service would break down boundaries between trades and industries, and would mobilize and organize scientific and technical workers in all branches of learning to serve in the building of socialist modernization in important ways. This would require placing economic construction at the center with the accent on solution to difficult problems in environmental science and technology. Consulting work should adhere to service first, strive for genuine effectiveness, earn a high reputation, improve quality of service, and strive to follow a course that is Chinese in character that both helps make the most of the initiative of scientific and technical workers and also helps gain support for the society from all quarters. In matters pertaining to income to meet expenses of the consulting service and its distribution, applicable regulations of the Chinese Science Society and the Ministry of Finance are to be strictly followed.

Fifth, it was decided in principle that plans for academic activities during 1983 should center around the convening of the Second Congress and be based on the society's scientific and technical achievements in recent years, plus systematic summarization and improvement in order to distill a pattern for discussions and to improve the quality of academic activities. In addition, international academic exchange activities should be enhanced. Plans for academic activities that have been reported to higher authority should be revised and merged as required. Following approval by the Chinese Science Society, the Environmental Science Society office's reworking of ideas put forward by individual special committees should be issued to individual special committees.

9432
5000/4178

PLA CONTRIBUTES TO ENVIRONMENTAL PROTECTION

OWO61142 Beijing XINHUA in English 1141 GMT 5 Aug 83

[Text] Beijing, August 5 (XINHUA) -- The Chinese People's Liberation Army has over the past three years brought under control more than 6,000 pollution sources, including the discharge of boiler smoke, waste industrial gas, liquid and residue, sewage from hospitals and oil tankage as well as radioactive sewage and various kinds of noise.

Since China held her first national meeting on air pollution in 1979, the headquarters of the ground, naval and air forces of the P.L.A. jointly promulgated provisional regulations on environmental protection in the Army and special funds for this were allocated. In addition, environmental protection groups have been set up above division level and in the majority of the attached factories and hospitals. More than 140 group members have taken part in the training courses run by the related department of the State Council.

70 percent of the Army hospitals now have facilities handling sewage discharge and cleaned up 99 percent of the pathogenic microbic matters in the waste water, up to the national standard.

The aviation repair plant of the Air Force has also taken measures to control noise in engine test runs, reducing it from 160 to 90 decibels.

At the same time the Army has made positive efforts in tree-planting, utilizing solar energy, exhaust heat and marsh gas. So far about 200 Army organizations have been cited as advanced collectives in environmental protection by local authorities.

CSO: 4010/91

PRC-U.S. ENVIRONMENT-PROTECTION VENTURE SLATED

OW060914 Beijing XINHUA in English 0716 GMT 6 Aug 83

[Text] Yinchuan, August 6 (XINHUA) -- Another Sino-U.S. joint venture will be set up in Yinchuan by the American MIS Company and the Ningxia Yinchuan Electrical Meter and Instrument Factory, according to a letter of intent signed here earlier this week. This will be the 12th Sino-U.S. joint venture operating in China.

Named the Can-Ning Company, meaning California and Ningxia, the manufacturing company will mainly produce equipment for rural environmental protection. It will also undertake business operations of MIS in China, including technical imports, technology promotion and consulting services. The two participants have agreed to run the joint venture for 25 years.

Substantive negotiations will be held next month on the joint venture agreement, contract and the constitution. The company expects to open business by the end of September.

CSO: 4010/91

BRIEFS

ENVIRONMENTAL SCIENCE SYMPOSIUM--The Second Conference and Scientific Symposium of the Environmental Science Committee, Chinese Academy of Sciences was held in Lintong, Shaanxi from 20-25 October 1982. The conference received more than 350 papers. There were enthusiastic exchanges on the subjects of the physical and chemical processes of atmospheric pollution, the effects of harmful gases on plants, organic pollutants in water and their control and treatment, heavy metal pollution of water and its prevention and control, the effects of pollutants on soil-plant systems, environment and health, and regional environment and ecology. The conference believes that at present environmental science has entered a new era of research and all environmental scientists should strive to contribute to the creation of a new phase. In order to adapt to these developments, in the future, research on basic sciences should be strengthened to broaden the number of key projects. At the same time, research on applied sciences should also be strengthened, especially research on new methods, new industrial processes, and new technology, for the purpose of struggling to obtain economic benefits, environmental benefits and social benefits. [He Jia] [Text] [Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 1, 1983 p 27] 6248

CSO: 5000/4142

'NATIONAL LAND MANAGEMENT' DEFINED, PRIMARY TASKS OUTLINED

Beijing DILI XUEBAO [ACTA GEOGRAPHICA SINICA] in Chinese No 1, 1983 pp 96-98

[Article by Guo Laixi [6753 0171 0823]: "First National Land Management Symposium Is Held in Nanjing"]

[Text] The China Geography Society and the China National Land Economics Research Society jointly held the nation's first Academic Symposium on National Land Management in Nanjing from 29 Nov. to 4 Dec 1982. The 235 delegates participating in the symposium came from related scientific research institutes, universities and colleges, planning and design departments, industrial departments and planning and management departments. Among the delegates were specialists in natural sciences, technical sciences, economics and management science, and middle-aged scientific workers and cadres. This academic symposium was a comprehensive and large-scale discussion meeting including many academic disciplines.

The delegates, who are experts in all fields, gathered together, and broke the past confinement of scientific disciplines. They discussed together the basic theory of national land management and the relationship between national land management and the development of the national economy, the categories, the characteristics, the goals and the key points in national land management, the theory, system, methods and procedures for national land planning, geography, especially the role of economic geography and national land economics in national land management and the direction of future efforts and other important academic questions. The delegates presented many valuable suggestions on how to develop national land management.

Director of the China National Land Economics Research Society Yu Guangyuan [0060 0342 6678], deputy director of the China Geography Society and secretary general of the China National Land Economics Research Society Wu Chuanjun [0702 0278 6874], member of the State Planning Commission, director of the Bureau of National Land, secretary general of the China National Land Economics Research Society Xu Qing [1776 7230] and deputy director of the China National Land Economics Research Society Li Deren [2621 1795 0088] spoke at the meeting. Deputy governor of the People's Government of Jiangsu Province Liu Hegeng [0491 0735 6342] and Director of the Nanjing Branch Academy of the Chinese Academy of Sciences Xiong Yi [3574 3015] also addressed the meeting.

At the symposium, Yu Zhixiang [0151 0037 4382] (Nanjing Geography Institute), Cheng Lu [4453 3406] (Huadong Teachers' University), Li Wenyan [2621 2429 1750] and Hu Xuwei [5170 1645 1218] (Geography Research Institute), Zhang Weibang [1728 4850 6721] (Shanxi University), Zheng Tianxiang [6774 1131 4382] (Zhongshan University), Shao Qingyu [6730 3237 1342] (Huazhong Teachers' College), Yang Wuyang [2799 0710 2254] (Beijing University), Chen Jingyuan [7115 2529 0337] (Jiangsu Provincial Metallurgical Design Academy), Hu Tongyuan [5170 2717 0337] (Yunnan Economics Institute), Yang Shuzhen [2799 2885 3791] (People's University) respectively, delivered academic reports on "The Problem of National Land Management in the Tai Hu Region", "National Land Management along the Lower Reaches of the Chang Jiang", "The Development and Economic Zoning of the Shanxi Energy Base", "The Problem of National Land Planning in the Beijing-Tianjin-Tangshan Region", "The Question of Water and Soil Conservation in the Loess Plateau", "Comprehensive Planning of the Shenzhen Special Economic Zone", "A Discussion on Integral National Land Planning", "Regional Planning of Greater New York", "The Question of Land Use in Jiangsu Province", "A Comprehensive Study and Correct Understanding of Xishuangbanna", and "National Land Management and Economic Zoning".

The symposium provided 3 days for group discussion. Liu Yuren [0491 5280 0117] (State Scientific and Technological Commission) represented the national land economics group, Li Zhenquan [2621 2182 3123] (Dongbei Teacher's University) represented the economic zoning and regional planning group, Ma Yuxiang [7456 5940 4382] (Hangzhou University) represented the urbanization and tourism group, Hu Zhaoliang [5170 0340 6852] (Ministry of Metallurgy) represented the plants mines, energy and transportation group, and Lu Dazhuang [7120 1129 1104] (People's University) represented the transform mountains and tame rivers and agriculture group. They reported to the symposium on the major views expressed in group discussions and the suggestions proposed by the delegates. Everyone believed this academic symposium was held at the right time, was successful, and achieved the expected goals. It will serve to move forward the nation's national land management work and theoretical research.

The symposium received more than 200 academic papers. The meeting decided to select the best papers for inclusion in the "Collection of Academic Papers on the National Land Management Symposium" and Yang Shuzhen [7122 2885 3791], Deng Jingzhong [6772 7234 0022], Wu Yiguang [6762 5042 0342], Hu Zhaoliang [5170 0340 6852], Liu Yuren [0491 5280 0117], and Zhou Zheng [0719 2398] organized an editorial group.

The central topic and main suggestions of this symposium can be generally summarized as follows:

I. National Land Management Is An Urgent Strategic Task

The delegates pointed out that the key to national land management is to improve land planning. National land planning is an important basis for working out medium and long-range national economic plans. To realize the general goals of the nation's economic buildup proposed by the 12th Party Congress and to complete the task of quadrupling the total industrial and agricultural output by the end of this century on the basis of the positive and negative experience

acquired since the founding of the nation, and in face of the tremendous pressure of population, resources and environment in the nation today, national land management is imperative and extremely urgent.

Some delegates cited mistakes in industrial planning in some regions to show that implementation of a scientifically proven national land plan can avoid the blindness and one-sided views during construction and save a lot of manpower, material and money for the state so that the relationship among sectors, among regions and between man and nature can be well coordinated. Therefore, delegates all believe that we must include national land management as an urgent strategic task in the daily agenda.

The strategic goal of national land management is to rationally develop and fully utilize national land resources on the basis of protecting these resources well, in order to realize a rational regional division of labor and to gradually establish a national land environment that is productive, that is developed, that has a stable ecology, that provides a comfortable life, and that provides high economic and ecological benefits.

As regards the method of national land planning, Xu Qing [1776 7230] pointed out that we must consider the national territory as a whole, study it as a whole, make comprehensive plans, propose correct strategies and principles for development, carry out rational development, utilization, management, protection and avoid uncertainty and one-sided views. Wu Chuanjun [0702 0278 6874] believes national land management is a complex question that involves nature, technology, society, and the economy. The common point is that we must carry out comprehensive efforts on a regional basis, i.e., conduct comprehensive investigation of national land resources related to the regions, comprehensively evaluate the development and utilization of these resources, comprehensively analyze the various conditions for economic development and construction, comprehensively balance the structure of the economic sectors and arrange the proportional relationship among regions, comprehensively control and protect the regional environment, comprehensively prove the result of regional development and construction projects, and finally draw up a plan for regional development or national land management. It will be comprehensive plan.

The delegates repeatedly discussed the key strategies of national land management, and everyone believes that with current national capabilities, the key strategies in national land management should be the following regions:

- (1) regions that have a major significance in developing the national economy;
- (2) regions that present serious potential dangers to national economic development;
- (3) regions that have a great potential in national economic development, i.e., those regions that can provide tangible political, economic and productive benefits to national economic development.

II. The Order of National Land Management Planning

The national territory is not a narrow piece of land. It is the totality of the territorial land, territorial waters, and territorial air space under the government of a sovereign nation. It is the foundation for a nation and people to exist and develop. National land resources are the total resources of the

nation. The basic content of national land management includes development, utilization, control and protection. The national land resources must first be drawn up according to the requirements of the general task of national economic development. Of course, we must also manage national territory to guarantee the implementation of national land plans.

What is the relationship between national land planning and regional planning, river valley planning, area planning and urban planning in the past? What inner links are there, how should we carry out these plans in actual work in the future? These are some of the central topics of discussion that everyone paid close attention to at the academic discussion meeting.

Some comrades believe that these different types of plans are the historical products of different stages. They all belong to one "family", but they are of different "generations". Under the new situation of developing national land management, each locality can carry out different types of planning according to its own situation, but planning must be carried out according to the requirements of national land planning.

Other comrades believe national land planning is regional planning of the past, but regional planning of that period was limited to the layout of industry, transportation and urban construction; national land planning requires considering the rational development and utilization of resources, the rational structure and distribution of industry and agriculture, and control and protection of the environment on an overall basis from the comprehensive point of view.

China is gradually developing national land planning centered around large cities, but how large is the scope of planning? How can we determine its main direction of development? What position does it occupy in the regional division of labor throughout the nation? These are all important questions that should be explored more thoroughly.

Some people believe that at present, the nation's national land management lacks mature experience. Each locality can establish test points for national land planning at different levels according to its own characteristics, then it can summarize and gradually popularize the experience.

Many delegates have advocated loudly that we must quickly develop studies on the nation's comprehensive economic zoning and use this to guide national land planning at each locality. Comprehensive national economic zoning should be regarded as zoning at the highest level in national land planning. What we call comprehensive economic zoning is to strategically zone the national territory according to the Marxist theory of social division of labor, to proceed from the actual conditions of each region in developing the economy, to point out the position and the direction of development of every economic zone in the entire national economy, and the characteristics of the economic structure of the regions, to provide a scientific reference for determining a rational relationship for regional division of labor and cooperation within the whole nation. Therefore, not proceeding from a nation-wide comprehensive economic zoning and carrying out national land planning in local regions will lead to blindness in national land planning and create an irrational distribution of productive forces. The scale will be inappropriate, the regional economic structures will be unmatched, the relationship between man and nature will be inharmonious,

and irreversible losses will be created. The delegates noted that under extremely difficult conditions not long after the October Revolution, Lenin still actively organized scientists to draw up an electrification plan for all of Russia, divided the whole nation into several economic zones, and guided the state's arrangement of production. Dr Sun Yatsen also proposed a strategy for national construction and an industrial plan very early. This showed that these leaders had foresight and sagacity. They had scientific foresight in national economic development. For the Soviet Union and China which have large territories, we must strategically guide development by regions in order to fully develop the superiority of the resources of each locality. In 1956, the nation included national economic zoning in the 12-Year scientific and technical development plan. It was a pity that this task which possessed major strategic significance could not be developed. If we want to implement national economic zoning on an overall basis, the amount of work will be huge, and will be difficult to accomplish right away. But to solve the urgent problems, we should first organize manpower. It is possible to quickly draw up a guideline for comprehensive national economic zoning. Otherwise, the later we begin the more passive our efforts will become.

III. We Must Correctly Understand National Conditions, Strengthen the Protection of Resources

"An expansive territory and an abundance of resources" is a customary statement used to describe China's condition. But the nation's population has surpassed one billion. The absolute value of land resources, water resources, forest resources and mineral resources is large, but the per capita value is far below the world's average value. Spreading the word about having "an expansive territory and an abundance of resources" and not facing the reality of "an especially large population" is blind optimism and will lead to policy errors.

Correctly understanding the national situation is the foundation for establishing our strategy for economic development. The actual situation in China is this: the per capita area of land and the per capita area of cultivated land are only one-third the world's per capita value; the per capita grazing area is less than 39 percent of the per capita value of the world; the per capita area of forest land and the per capita amount of timber reserves are less than one-sixth and one-seventh the per capita value of the world respectively; even the per capita amount of the more abundant coal resources is less than one-half the per capita value of the world. In addition, the cultivated land which the people rely on for survival has decreased by about 465 million mu since the founding of the nation because of capital construction and natural disasters. Each year, the area of cultivated land decreases by 15.5 million mu; in recent years the reduction has increased to 25 million mu, and there are few reserve resources of arable land. Nation-wide 1.5 million square kilometers of land have been seriously eroded. Each year, about 5 billion tons of soil are eroded, causing the fertility of the land to drop, the grasslands to degenerate, desertification is becoming more serious, and the population increases every year by about 15 million people. In face of such grim facts, the results of realizing socialist construction and modernization will be devastating if we do not love the land, value resources and protect the environment.

Chen Jingyuan [7115 2529 0337] pointed out that Jiangsu Province loses 800,000 mu of cultivated land each year, most of it fertile and high yield land. There are 70 production brigades that have no land to cultivate in the suburbs of Changzhou City. The cultivated land in the suburbs of Wuxi City in 1980 was 42.2 percent less than that at the beginning of liberation. During the same period, the area of cultivated land in the suburbs of Suzhou City decreased by 67.9 percent. If this trend is not strictly controlled, and the rate of land occupation at the present time is maintained, there will be no land to cultivate in the suburbs of Suzhou, Wuxi, and Changzhou within 30 years. The three cities will surely become one expanse and the area along the Shanghai-Nanjing line will become the nation's largest group of metropolises.

The delegates believe that the proposal by the Central Committee to regard the treasuring of land resources as one of our fundamental national policies is very correct. But at the same time, we should also rationally use land. For example, in urban construction, under the prerequisite of preserving historical and cultural characteristics, we should devote efforts to renovating existing towns, increase the density of the buildings, develop upwards (tall buildings), downwards (building underground public facilities), and also reclaim land from wilderness and beaches while maintaining the ecological balance. Dou Zhengguo [4535 2973 0948] of the Shanghai Land Reclamation Office said, the mouth of the Chang Jiang has been divided by Congming Dao into a northern and a southern branch. In the 18th century, the main stream at the mouth of the Chang Jiang reverted back to the southern branch and the northern branch gradually dried up. Islands of sand connected to the banks emerged.

Some people suggested that by plugging the northern branch, more than 700,000 mu of fertile land could be acquired. This is one important measure to ease the ever increasing shortage of land in the Chang Jiang delta. But the plan to plug the northern branch must be subjected to comprehensive study and proof.

Chen Jingyuan [7115 2529 0337] suggested the technique of using soil coverings and selecting land to reform unclaimed slopes, river banks, ditches and pits, ash yards, slag yards, garbage dumps, tail ore yards which are unsuitable for planting. Although the investment is higher, it is reasonable in the long-term view because land is an irreplaceable, valuable resource. It is the productive resource man relies upon for survival. Wang Xiaozhuo [3769 1420 0587] of the Xi'an Petroleum Academy believes the method of land management currently in force is unfavorable to a conservative use of land. We should study and draw up land taxation laws and use legislative means to protect land. Some delegates pointed out that similar problems also exist in the development and utilization of resources. For example, plants and mining enterprises do not pay for the protection or the renewal of resources in mining and felling. In fact, this constitutes developing and using national resources without cost. Whoever exploits them more will reap more profit, and is not at all favorable to a rational exploitation of resources. We must similarly study laws to tax the exploitation of state-owned mineral resources and forest resources so that the nation's limited land resources, water resources, forest resources, and mineral resources can serve socialist construction and modernization in this generation, and at the same time, create benefits for future generations.

IV. We Must Pay Special Attention to the Management of Regions with Serious Potential Danger

Delegates believe that while emphasizing the management of the main regions in the east, we must pay attention to the study and management of regions that pose

a serious potential danger to national economic development. This is also a job that has strategic significance. The work that must be done in this type of regions include water and soil conservation along the middle reaches of the Huang He, water and soil conservation along the middle and upper reaches of the Chang Jiang, the protection of the tropical ecological environment in Xishuangbanna and Hainan Island, and the protection of the green corridor along the lower reaches of the Tarim River.

The Huang He River Valley is the cradle of the Chinese nation. The serious destruction of vegetation of the loess plateau has led to an ecological imbalance, environmental degradation, and the region has become the most serious potential danger in the nation. Delegates pointed out that at present, the state is controlling the Huang He, Huai He and Hai He regions, this is not sufficient. It is essential to consider these regions together with the middle and upper reaches of the Huang He, otherwise, we will get half the result with twice the effort, or even achieve nothing for our efforts. For more than 30 years, the engineering projects to control the Huang He have been effective. The lower reaches of the Huang He have safely passed the flooding seasons many times, and have ensured that the people can live and work in peace and contentment. They are undoubtedly a great achievement, but a greater potential disaster of a dangerous river is present. The riverbed in the lower reaches of the Huang He silts and rises an average of 1 centimeter a year. The height of the large dyke at Liuyuankou is now 15.6 meters above the ground surface of the famous Kaifeng Tower. When the river overflows, a large expanse of national land will be damaged and the life and safety of millions of people will be endangered. This will directly affect the progress of the nation's four modernizations. We must quickly find a countermeasure to eliminate the potential danger.

Wen Cunde [3306 1317 1795] of the Huang He Management Committee believes there are many reasons why the Huang He causes disasters. There are natural causes, social causes, technical causes and policy causes. In the past, efforts to control the Huang He by water conservancy took into consideration only water conservancy and efforts to control the Huang He by water and soil conservation took into consideration only water and soil conservation. The Huang He was not taken as a whole in comprehensively examining and studying all of its resources. We did not establish a comprehensive plan of control, protection, development and utilization, and we did not work together to eliminate the dangers. To change this situation requires overall management of the upper, the middle and the lower reaches from the high level of national land planning.

In the summer of 1981, the especially large flood in the upper reaches of the Chang Jiang was a profound lesson for people. This flood inundated 57 county seats and 776 county towns within Sichuan alone. The population in the disaster area was about 20 million. The reason for the flood not only included a special weather system that brought rainstorms, the impact of human activity upon the environment aggravated the disaster. Specialists pointed out that the amount of sand transported by the Chang Jiang each year amounts to 480 million tons. Although this is not as much as that of the Huang He, it is still a sizable amount. Silt mainly comes from the middle and upper reaches. According to investigation, the average modulus of erosion of the purple soil region in the Sichuan Basin is 8,500 tons per square kilometer, and in serious cases, it

reaches 70,000 tons per square kilometer. This must also be controlled and protected early.

Xishuangbanna is a "genetic bank of species" in China's tropical regions and it is difficult to replace. It is also the nation's second largest natural rubber base. It has great economic value and scientific research value. Because of the impact of human activity, forests are severely damaged. Some residents still carry on the tradition of slash-and-burn cultivation. Forest land has decreased from the 16 million mu at the beginning of liberation to the present 8 million mu. This has reduced the number of foggy days and has caused evaporation to intensify. The relative humidity has dropped, the content of sand in the rivers has increased, and some precious tropical wildlife have lost conditions for survival. Hu Tongyuan [5170 2717 0337] suggested that we should conduct comprehensive studies on Xishuangbanna, thoroughly implement protection as the primary task so that it will become a true scientific research base and a tourist attraction. Yu Guangyuan [0060 0342 6678] proposed the establishment of an "academic study on Xishuangbanna" after surveying Yunnan and proposed organizing manpower to write a special book "A Survey on National Land Economics in the Region - Xishuangbanna"; he also proposed conducting feasibility studies and practicality studies.

Huang Wenfang [7806 2429 2075] of the Xinjiang Geography Institute called attention to desertification. He said, one of the most urgent problems in Xinjiang is to protect the green corridor of 1 to 5 kilometers wide along the lower reaches of the Tarim River. If countermeasures are not taken, this strategic channel that links the southern and northern parts of the Tarim Basin and Xinjiang with the inland will be buried by the desert, thus linking the Kuruk Desert and the Taklamakan Desert. Management measures should consider the benefits of the upper, the middle and the lower reaches of the Tarim River, rationally distribute water sources, strictly prohibit the felling of diversiform-leaved poplar and salix purpurea and other sand stabilizing plants, strengthen artificial cultivation of forest trees, and at the same time, use mechanical measures to stabilize sand.

To conscientiously focus on national land management, the delegates suggest that a higher level national land planning committee directly led by the State Council should be established, the State Council should hold a nation-wide national land working conference early, a nation-wide national land research agency should be established, the training of people in national land management should be strengthened, a national land management publication should be established, and propaganda for national land management should be actively launched and disseminated.

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CSO: 5000/4164

RELATIONSHIP OF NATIONAL LAND MANAGEMENT, ENVIRONMENTAL PROTECTION VIEWED

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 1, 1983
pp 5-8

[Article by Wang Dengsan [3769 4098 0005]]

[Text] All countries of the world consider the management of national land to be an extremely important problem in recent years and a new science of land economics has been formed to study land management theory and methods. Essentially, it involves the scientific description and analysis of land economics to discern the correct principles and policies, to propose measures and suggestions on the development and control of the land resources of a nation, and to carry out scientific research on improving the laws, the governmental responsibilities, and the administrative agencies and other problems relating to land economics. In a word, it is the correct way of investigating national land management from the viewpoint of economics.

China also has emphasized land management and a National Land Bureau has been established within the State Planning Commission. The components of land management include mainly the five interrelated areas of investigation, development, utilization, restoration and protection of the land resources of the nation. Land resources are national resources which may be divided into the two categories of natural resources and social resources. Natural resources generally refer to the land, water, mineral deposits, organisms, the seas, etc. Social resources include manpower and intelligence and also include the cultural traditions and the material and technological foundation of society.

Why have the problems of land management and land economics emerged in many countries of the world? The reasons are as follows:

1. The conflict between population increase and the expansion of cultivated area is becoming more compelling everyday. Land is the foundation upon which mankind relies for existence, but land resources are limited. With the increase of population, the development of industry, transportation and urban construction, the quantity of land continues to diminish. For example, during the period of 1950-1978, the population of Japan increased from

82 million to 114.9 million, but the per capita land under cultivation was reduced from 1.1 mu to 0.65 mu. In the USSR, a country of abundant land resources, although 630 million mu of wasteland were reclaimed during the 1950's, the per capita acreage under cultivation was reduced from 15.5 mu in 1960 to 13.1 mu in 1978. In the early stage after liberation, China had 1.46 billion mu of land under cultivation and in the 30 years following another 480 million mu were reclaimed. There was destruction of the ecological balance; and, the desert area expanded, resulting in a net loss of more than 200 million mu. The growth of residential areas took another 200 million mu, the current cultivated acreage is only 1.5 billion mu. Compared with that of 1949, there has been hardly any increase, but the population has more than doubled. This shows that the potential for future expansion of cultivated acreage is not great. If cultivated acreage is expanded, the ecological balance will be destroyed and cause desertification. On the other hand, due to population increase, the residential environment will continue to use more land. The current effort to raise the unit yield of grain also has caused pesticide and fertilizer pollution. Because of water and soil erosion, desertification, and salinization and alkalinization, farm-land is continuously shrinking. Rational utilization and restoration of land resources must be included in the daily agenda to stop this situation from developing.

2. The irrational development and utilization of natural resources, such as the destructive felling of trees, the abusive mining of mineral deposits and groundwater resources, the abusive capture of valuable and rare wild animals, exhaustive catching of aquatic organisms, extensive utilization of land and grassland, irrational construction of large-scale water conservancy projects, creating fields around lakes, burning forests for reclamation, etc., have seriously destroyed the ecological balance and natural resources and has caused the area of erosion in China to expand from 1.1 million km² in the early stage after liberation to 1.5 million km². Five billion tons of soil in the country are lost every year from erosion alone, carrying with it 40 million tons of nitrogen, phosphorus and potassium fertilizer, the equivalent of the current total annual output of chemical fertilizer in the country. Desertification of land continues at a rate of 1,000 km² per year. The frequent occurrence of flood, drought and alkaline calamities in the Huang He, Huai He and Hai He Plains and severe water shortage of the North China Plain, etc., are all serious problems preventing production from further advancement.

3. Environmental pollution is becoming more serious everyday. The amount of "three wastes" of industry discharged in China is very large. According to 1981 statistics, there are more than 4.2 billion tons of hazardous substances in the waste gas released in the country annually, and more than 14 million tons are sulfur dioxide. In the country, 30.3 billion tons of wastewater are discharged per year, and 90 percent is directly drained into the rivers and lakes without treatment. In a year, the country discharges 430 million tons of industrial waste residue and throughout the years 5.4 billion tons have piled up. This waste residue takes up a large amount of land and seriously contaminates the soil. The rapid growth of rural commune and

brigade enterprises has caused environmental pollution to expand from the cities to the countryside. The distribution of industries and cities is extremely irrational and industries are over concentrated. Many industrial cities and large industrial districts are concentrated in a few coastal urban centers, causing these areas to bear a heavy burden of pollution. The environment is deteriorating, traffic is crowded, energy is in short supply and the increasingly severe unfavorable ecological condition has greatly reduced the economic benefits of these areas.

If the aforementioned conditions are not changed promptly, and are allowed to develop further, the progress of the four modernizations will be seriously affected and it will be difficult to improve production and living conditions. Therefore, land restoration is not only a strategic task for long-term economic growth, but also an urgent task requiring immediate action.

The goal of land management is to promote economic development. On the basis of protecting national resources, its task is to fully and effectively develop and use natural and social resources of the country, to rationally distribute population and productive forces, to handle the relationship between men and nature well and to harmonize the relationship between socio-economic development and the protection of natural resources and ecological environment. Its aim is to establish a national land environment with developing production, stable ecology and comfortable living. Its goal and task are consistent with those of environmental protection and environmental protection is a major force in land management. The two are inseparable. The principles of land management and environmental protection are basically the same. These principles are:

1. The principle of ecological economics: Ecological laws are laws that man must follow while carrying out production activities. The rational utilization of land resources has important significance for the protection of the natural ecological environment, the study of the relationship between resource utilization and ecological balance, and is one of the important topics of environmental economics as well as land economics. It may be said that land resources are composed of ecological systems of all sizes, the existence and development of which depend upon the maintenance of their relative balance. They are interrelated, interdependent and interact to form a complete unity. Any activity that uses and transforms nature contrary to ecological laws will incur nature's retribution sooner or later, and there can be no expected economic benefit to speak of. In order to understand ecological laws, it is necessary that those engaged in production have an overall point of view, a long-term point of view and a corresponding point of view. Not only should economic benefits be considered in developing and using land resources, ecological benefits must also be considered. We should not only pay attention to current benefits, but also the long-term benefits for future generations. Land resources should be fully and rationally used, and the benign cycle of the ecological system should be maintained.

2. The principle of strategic arrangement: Land is a whole entity. There is interdependence and interaction among various resources and among resources, the environment and the population. The speed and scale of national economic growth and society are determined to a large extent by the development of land resources, the extent and result have a direct impact on the future of the nation and the welfare of the people. If land resources are developed well, the economy will develop rapidly, the ecological environment will be good and the people will receive more real benefits. If land resources are not developed well, it will cause long-term serious consequences and untold troubles. Land restoration is a long-term plan, and a task that continues for a long time. It must not be viewed as a temporary measure. This problem cannot be solved in a superficial manner. There should be a strategy for the development, utilization, restoration and protection of land based on China's conditions and overall benefits, or what may be referred to as a comprehensive plan that is farsighted, objective and strictly enforced.

Since Liberation, there have been many problems in China with regard to the development and utilization of land resources and environmental protection. The reasons are many, but one major reason is the lack of a clear and precise strategy in land environment work. There has not been careful consideration and overall arrangement for ways to rationally use land, ways to distribute population, cities and productive forces, ways to develop and harness rivers, ways to comprehensively utilize minerals, etc. Frequently, the subjective desires of a few individuals were implemented on a large-scale. The results were often contrary to the expectations. The development of natural resources was often accompanied by the destruction of natural resources. Destruction occurred while construction proceeded. Frequently what was destroyed was greater than what was constructed. The increasing deterioration of the environment occurred mainly because of this situation.

The strategic goals of land management and environmental protection are generally targeted for a period of 10 to 20 years, that is, the basis of the principles and conditions must be put forward and the important policies and measures to be adopted for the overall and regional goals of land management and environmental protection must be implemented by the year 2000. Because land management and environmental protection are similar, strategic goals should be organized and carried out together.

3. The principle of rational distribution to suit each locality: To a large extent, the rational development and utilization of natural resources, the impact on the environment, and economic benefits are determined by production layout. For example, if integrated industrial enterprises are organized and distributed around coal resources, linking the production processes of coal mining, power generation, chemical and building material sectors, then the extent of comprehensive utilization of coal resources can be greatly enlarged, increasing the economic benefits, reducing the discharge of the "three wastes" and protecting the environment.

Natural and social resources are obviously regional. Land management must proceed from local characteristics, measures must be suited to local conditions, and advantages should be stressed and shortcomings avoided. If local conditions favor agriculture, agriculture should be stressed; if it favors animal husbandry, animal husbandry should be stressed; if it favors forestry, forestry should be stressed, thus the maximum economic and ecological benefits will be obtained. It is the same for environmental protection work. Different natural environments have different capacity to dilute, disperse, or purify different kinds of pollutants. How to plan productive forces in line with national assimilation and local characteristics have important economic significance for land management and the reduction of environmental pollution.

4. The comprehensive principle: Land management work has broad ramifications. It involves many sectors and regions. It involves the realms of nature, economics, society, technology, etc. With such a large item as land development and restoration, the advantages and disadvantages of different sectors, industries, and regions cannot be completely identical; therefore, a comprehensive study and investigation based on the requirements of economic and ecological laws is necessary in order to obtain better economic and ecological benefits. For example, the comprehensive treatment for flood, drought and alkalinity problems in the Huang He, Huai He and Hai He Plains depends on the success of water and soil conservation in the loess plateau of the upper and middle reaches of the Huang He; the treatment of the plain in the lower reaches of the Chang Jiang must be linked with the comprehensive treatment of the hills and mountains along the mainstreams and tributaries. The research and formulation of these comprehensive development plans require the cooperation of many sectors, disciplines, and individuals. All important engineering and biological measures must be studied for comprehensive analysis and verification, and comprehensive evaluation of the combined ecological and economic benefits.

It is the same with environmental protection. Pollution control of a city, an industrial region, or a river must also be carried out comprehensively. It will not do to pursue a single project. Therefore, environmental protection work should be combined with land management work to produce complementary results.

Environmental protection work and land management work are implemented mainly through organization, coordination, planning, legislation, and supervision. Therefore, the key to doing a good job lies in strengthening organization, coordination, supervision and investigation.

Land management and environmental protection should also be closely linked with the development of the national economy. Socialism is a planned economy. There should be a plan for socialist modernization construction; there should be overall surveys of resources to provide the foundation for good economic and construction arrangements and to proceed with rational development and utilization, and at the same time counter the destruction of natural resources

and the ecological environment by carrying out planned treatment and protection. Therefore, land restoration and environmental protection must be included in the long-term plans for the national economy after an extensive evaluation, as a component of the plan, the guarantee and possibility will be achieved.

The determination of land construction projects, especially the important ones, is a major issue affecting the overall development and utilization of the lands of the nation; therefore, a great deal of preparatory work and feasibility studies must be done before implementation. Evaluation and regulations on environmental impact formed during environmental protection work, will play an important role in land development and utilization. Environmental protection issues such as the supply of water and the environmental impact of some urban or large construction projects, frequently can be solved only through a great deal of work in the area of land planning.

This shows that land management and environmental protection are interdependent and mutually complementary. The two must cooperate and support each other, but must not duplicate one another. The emergence of land management work will undoubtedly promote and expedite environmental protection work in China. Therefore, the two forces of land management and environmental protection should join hands, support one another, closely coordinate and struggle together to build the country into a land environment of production development, ecological stability and comfortable living.

6248

CSO: 5000/4142

LAND PLANNING AS KEY TO LONG-TERM NATIONAL ECONOMIC GROWTH

Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 3, 1983 pp 2-3

[Article by Xu Qing [1776 7230]: "Several Questions Concerning Needed Research on China's National Land Management"]

[Text] I. The Strategic Question of Land Development and Management

This issue underwent an organized discussion in Beijing in July 1982. It was a well-conducted conference in which many good ideas were presented, initial interchange was made, and results were achieved. However, the discussion on the problems of a land strategy is not over and must continue to develop in depth. I believe that this question is the general guiding ideology for national land management work in the future and is the tentative plan for the overall situation and arrangement. What are the goals to be realized in the next 20 years that include national land management? How should we begin with the work in the near future? How do we maximize economic and ecological benefits from limited human, material and financial resources? According to China's actual needs and possible conditions, we should determine a number of major development and management projects.

These questions were not thoroughly discussed in the last conference and there was some divergence of views. For instance, what are the strategic goals of China's national land management in the future, which generally refer to those that can be achieved by the year 2000 and not in the distant future? This needs to be studied and explored according to both the needs of economic development and the demands of the ecological environment, and in addition, the current state of China's national conditions and strength. Such goals can guide the people to advance according to laws and can be reached through efforts. We must be explicit and specific as possible in putting forth national land management goals which are in accord with China's characteristics, of the "well-off family" type and attainable in 20 years.

There are different views on the emphasis in development and management. Some advocate putting emphasis on developing backward areas, for even though it is slightly more difficult, it is significant to easing China's population pressure and maintaining a balanced distribution of productive forces. Some advocate putting emphasis on developing coastal, economically prosperous areas and give full play to their economic potentials and regional advantages, which involves

low investment, great results and favors speedy increase in China's economic strength. Some advocate stressing both ends, stressing economically prosperous and backward areas. This question was well discussed, which has basically unified our understanding and is consistent with the "Sixth Five-Year Plan" recently determined by the State. Seen from the interests of the overall plan, we should first enliven the coastal areas so that they will rapidly develop. At the same time, we should gradually move the techniques in coastal areas westward, use local raw materials for processing and marketing so that the economy of the east and the west may prosper.

Where should we put the emphasis on the relationship between development and utilization on one hand and control and protection on the other? This question should be looked at dialectically since national land management serves the basic interests of the masses in the long run and must also resolve existing, serious problems. Our goal is to develop the economy for the benefit of the people. Proceeding from this goal, development and utilization, and control and protection compliment each other and cannot be separated.

The aspects and issues touched on by the strategic question of national land management are numerous, and we still need to exert our efforts to study them in the future. National land management will have direction only if these questions are understood.

II. China's National Conditions

The national conditions discussed here refer to those of territory and resources. This question is very important because it is the foundation and the starting point. Japan has summarized its national conditions in three phases: "Large population, small territory, and poor resources." Their nation is founded on this basis. In the past we have correctly summed up the nation's characteristics as "vast territory, abundant resources, and a large population." But these words can no longer entirely reflect our national conditions. Although our territory is vast, our cultivated area is small, and although we have abundant resources, their average per capita is not high. For instance, the average land area per capita in the world is 50 mu, in China it is less than 15. The average cultivated land per capita in the world is 5 mu, in China it is less than 2. The world average of forested land per capita is 15 mu, in China it is merely 1.9. The world average of grassland per capita is over 15 mu, in China it is less than 5. The average water resources per capita in the world is 11,000 cubic meters, in China it is a mere 2,700. Mining resources are also correspondingly insufficient in China. For instance, China's coal reserves rank third in the world and are considerable, but the average per capita is merely 1,465 metric tons while in the world it is 3,146. It is obvious that a large population has been a burden to the country. If we do not understand this basic characteristic, we cannot possibly make a correct policy decision on national land management.

III. How Should We Tackle the Question of Land Planning?

The central authorities have proposed that we strengthen legislation and planning in land work. This is correct. My understanding is that land planning is the key to land development and management.

Land planning is a new task, we need to examine from theory to practice. For example, on the question of the nature of land planning, what purpose does it serve? I believe that land planning is by character long-term planning, but it is unlike developmental planning in the national economy and social undertaking. Land planning must be in accord with three characteristics of land work: strategy, comprehensiveness and regional character. It is a question of land planning for the rational exploitation and utilization of resources and their control and protection. Land planning should serve to develop the economy and cannot avoid the basic goal of human survival and development. Its condition can no longer be the one-sided development which pays the price of sacrificing and destroying the ecological environment for the pursuit of economic advantages. We must build land planning on the basis of natural and economic laws in order that economic development may be harmonious with the population, resources and environment.

How does land planning relate to regional planning in the past? Is what we now propose to do now in area planning, economic zone planning, and developmental planning centering around large cities the same thing? These questions are yet to be understood through practice. I feel that land planning and regional planning are basically the same, as they both belong to area planning. But regional planning in the 1950's was limited by historical conditions at that time, as its scope was narrow and it mainly involved the construction pattern of industries and cities. Now we must proceed from the comprehensive angle, give overall consideration to the rational exploitation and utilization of resources, rational structuring and distribution of area industries and agriculture, as well as control and protection of the environment.

The relationship between land planning and long-term developmental planning in the national economy. In general there are four views. One view regards land planning as the basis of long-term planning in the national economy. Long-term planning in the national economy is the means to realize land planning. The second view sees land planning as the continuation and substantiation of long-term planning in the national economy. The third view believes that the two are the same thing. The fourth view holds that land planning is one of the bases for formulating long-term planning in the national economy. Which of these views is in accord with China's reality? I believe the fourth view is more so, and our work in planning is launched according to this view.

Do we need to deal with land planning for the whole country? I think sooner or later this is necessary, but we must create certain conditions and accumulate a certain amount of experience. We cannot possibly do that yet. At present we want to start with several areas, then deal with provincial areas, and finally the whole nation. To deal with national and provincial land planning, some comrades have proposed to first deal with national economic divisions by dividing the whole country into several large economic districts on the basis of natural and economic conditions, stipulating their economic orientation and defining their character, tasks, and features. This view is correct and the work is necessary, but there will be numerous difficulties. It is hoped that comrades in geographic and economic circles study this problem in earnest. I believe that before national economic regions we should first work on provincial economic divisions. This task is already being carried out in some places and should be gradually developed.

IV. The Question of Land Management

I think the most urgent question at present is national land legislation. Do we need to work on a national, comprehensive land law at this time? Should we first work on a specific or comprehensive land law? What substance should a national land law include? Since the scope of territorial names have not been clearly defined,, there will be certain difficulties in practice. Recently, we held a forum in Nanchang among personages from economic and legal circles. As a next step we must concentrate on research.

V. Basic Theoretical Research on National Land Development and Management

I feel that it is necessary to put this question on the order of the day. The present theoretical preparation for land work in China is inadequate. Land work must not only determine the nature but also the quantities of things. The application of modern science and technology requires us to explore new theoretical methods. Of course, work cannot wait until theoretical research is completed before it begins and we need to summarize our experience through practice. But we need to strengthen theoretical research and allow it to lead and guide actual work as much as possible. I hope we will all study and explore.

VI. Tentative Ideas on Present National Land Management Work

Land development and management are a great cause that benefits mankind. The realm touched on by land work is very broad. It is strong in scientific character and is a comprehensive work that cuts across departments and disciplines. The development of China's economic construction must rely on science and technology. National land management work must rely on science even more and must be built on a firm scientific basis. This is the basic guiding ideology and principle in developing national land management work. Therefore, we hope even more natural scientists, economists and social scientists join the great undertaking of national land management, give play to their intelligence and wisdom, and make their own contribution.

At present, I have tentatively thought of the following eight areas of work and hope that concerned specialists and scholars, and comrades of concerned departments and areas actively participate.

1. The study of major national land management issues. There are numerous questions in this area and it is primarily a question of selecting the topics. In particular, we need to select some topics which need to be resolved and which have major economic benefits.
2. Investigative research and comprehensive investigation on land resources.
3. Land planning, regional planning, area planning, and planning for economic divisions centering around large cities, which need scientists to participate in and study.
4. The study of land laws and its system.

5. The systematization, analysis and study of source materials on land at home and abroad.

6. The work of training qualified personnel. To develop land work we need people, and the training of cadres is the most urgent task confronting it. In the long run, we need to establish in universities specialized land studies and to train qualified personnel. At present, we should primarily organize classes, supply teaching materials, and participate in teaching in the classroom.

7. We must conduct extensive and in-depth propaganda activities. In popularizing national land management we must have a scientific attitude and scientific language, and we must understand national land management in scientific terms, explain national land management scientifically, and expound on the objective inevitability and practical significance of the work. We must make everyone aware of it just like the population problem. The second anniversary of the strengthening of national land management work by the central authorities was 2 April 1982 and it is necessary to popularize it on a large-scale. It is hoped that everyone will participate actively and write a number of convincing essays that have theory and facts from different work posts and angles.

8. Theoretical research needs to be launched. Topics are numerous, for example, theoretical inquiries that need to be made on the concept, nature and scope of national land management, the three characteristics of land work (comprehensive, strategic and regional character) and so forth. In addition, there are the theory, system, methods and procedures of land planning, as well as the study of its relationship with the long-term developmental planning in the national economy.

The above eight areas of work might be comprehensive, but they are truly questions that urgently need to be studied. They are put forward for everyone to study and use as reference.

9586

CSO: 5000/4160

RE-THINKING CONCEPTS OF NATIONAL LAND PLANNING IN CONTEXT OF OVERALL ECONOMIC GOALS

Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 3, 1983 pp 28-29

[Article by Li Fuxian [7812 4395 6343]: "A Discussion On Land Planning"]

[Text] Land planning is a new concept raised in conjunction with national land management. In China this new type of work has just begun and so far there is no systematic theory or complete experience abroad. I will now discuss some superficial views from my own study and understanding so that others may come up with valuable opinions and hopefully it will initiate a general discussion.

I

What is land planning? In 1958, Holland defined land planning as "providing guidance to land development of an area in order to promote and form a model that is national and most suitable to the state of the society." Later, in the 1970's, land planning in Holland had developed from a policy on land utilization to one that aims at land structure and environmental quality. Land planning in North Korea is known as general planning for land construction for the development of the national economy and the advancement of the people's welfare by rational development, utilization, systematization and beautification of land, and by arranging national economic life with foresight and planning. In China, some comrades have called land planning land planning for development and management, while some call regional planning land planning. Obviously, there are different ways of understanding land planning. The meaning and substance of land planning also vary among countries.

National land is a specific part of the world administered by a sovereign state. It is a three-dimensional regional concept that includes national territory, territorial air space, and territorial waters. As the name implies, land planning is planning for national land or a certain part of the land. The territory referred to here is the collective name for land resources (including natural, economic and social resources), while planning means centralized and scientific planning for development and management of land resources. The primary realm of the work of land planning is to study and resolve problems that cross departments and regions. Its goal is to utilize resources in the most rational and most economic way, to maximize economic benefits, promote faster economic growth, create a fine ecological environment for the production and life of the people, and enable the harmonious development for people and the natural environment they rely on.

Therefore, land planning has three distinct characteristics. The first is its strategic character. This means not only must we proceed from our present needs, but also base ourselves on long-term interests, give macroscopic consideration and make proposals on national or area development and utilization of land resources, carry out strategic distribution of economic construction, control and protect the environment in a planned way and step by step, establish clear and defined goals, and through prolonged efforts create an environment with production growth, a stable ecology and suitability for life. The second is its comprehensive character, which proceeds from the overall situation and long-term interests, and through multi-disciplinary, comprehensive analysis and verification, makes comprehensive proposals for economic development and national land management for the whole nation or an area in order to achieve rational economic, social and ecological results. The third is its regional character. Based on the diversity of regional conditions it gives full play to favorable conditions of all areas, gradually form rational production specialization and regional division of work.

Land planning must center closely around state economic and social development plans. It includes the preliminary work of the earlier stage of planning as well as the work of plan formulation and in the course of implementation. It also includes the continuation and implementation of planning. Thus the tasks of land planning can be summed up in the following aspects: (1) Finding out about land resources, carrying out comprehensive evaluation, and providing a reliable basis for the formulation of economic and social development plans through investigation and research. (2) Based on the needs of the formulated plans, organizing concerned departments to conduct comprehensive analysis and verification so that the plans are in accord with the demands of national and economic laws. (3) Distributing productive forces rationally, coordinating to resolve contradictions between department and department, district and district, and department and district so that the plans (including medium and long-term plans) will be implemented regionally. (4) Making proposals on land control and protection projects which have a major influence on economic development and the people's life for the whole nation or a certain area, and also enabling it to be included in state plans for gradual implementation.

The substance and emphasis of land planning in different areas may differ. For example, areas that are more adequately developed and economically more prosperous stress harmonizing contradictions among all departments and areas, regulating the distribution of productive forces, organizing rational economic relations, and preventing and controlling the growth of pollution. For drainage areas, we should center around the development and utilization of water resources, utilize them comprehensively, give overall consideration to hydropower, water conservancy, shipping, aquatic products, and water supply in coastal cities. Areas whose ecological environment has suffered serious damage, should emphasize research to propose feasible control proposals. In short, area land planning must proceed from reality, suit measures to local conditions, and resolve whatever problem there is without imposing arbitrary uniformity.

II

Like land work, land planning is not something new. It is only due to different historical periods with different levels of understanding, scientific and technological levels, and depths in the methods of planning that results are

different. In ancient times water conservancy projects were built, roads were repaired and constructed, and canals were cut, which can be considered work that had the character of land planning. For over 30 years since China's liberation, under the central guidance of state plans China has carried out a great deal of land work as well as work characterized by land planning such as comprehensive survey of resources, prospecting, exploitation and utilization of mining resources, building of industrial bases, new cities and towns, the planning of rivers and drainage areas, the planning of agricultural districts, and the control of the Huang He, Huai He and Hai He. But these tasks are mostly carried out separately by departments and districts, and they lack comprehensive and overall research and planning. Consequently, when some results are achieved they also bring some unfavorable effects and problems such as inadequate and irrational utilization of resources, even creating great wastes which affect the speed of economic development. Shortcomings in the distribution of some productive forces also create long-term irrationality. Excessive lumbering in forests creates a reduction in vegetation growth rate. Excessive grazing causes pastures to deteriorate and become sandy. Water erosion of the loess plateau is increasingly serious and the ecological environment suffers serious damage. In the current socialist construction, many questions urgently demand a unified plan. For instance, for many years the average runoff rate of the Huang He has been several tens of billion cubic meters, but the development of agriculture and animal husbandry in Qinghai, Gansu, Ningxia and Nei Monggol, the development of energy resources in Shanxi and Shannxi, the chief agricultural districts in Henan, Shandong and Hebei, as well as some cities must draw their water from the Huang He. This creates the problem of distribution of limited supply of water. Only by proceeding from the interests of the whole country, weighing the advantages and disadvantages, and making rational arrangement will we benefit economic growth. These problems are precisely the arduous tasks confronting our land work and land planning. Therefore, it can be said that land work and land planning are a great strategic task raised by summing up the experience and lessons in China's 30-odd years of socialist construction.

Land planning is neither the simple repetition of various types of planning in the past nor is it the mechanical combination of planning of various departments and areas. It is a higher level of planning. It must be based on various types of partial and individual planning but cannot substitute departmental and trade planning. Land planning relating to an area must be based on the conditions and characteristics of the area, stress some of the major problems which concern the overall situation and which have a far-reaching influence, analyze and verify, and put forward opinions that are based on principles and orientation. Rough and outline plans are to be drawn up. In a certain sense, it is planning with the character of a program and can be called a planned program. The relationship of this planned program with departmental and professional planning is that of a key link and an outline. It serves to guide and restrain departmental and trade planning. Land planning is a planning system formed from the land planned program and plans of various departments and trades. Through land planned program, the plans of departments and trades form an organic combination and a harmonious development. Therefore, based on this meaning, we say that land planning is a new type of work.

The program for land planning can be national or regional. There are generally two types of programs for regional land planning. One type has a comprehensive

character, such as the planning for the Beijing-Tianjin-Tangshan area and the Chang Jiang Delta area. The other is topical, such as the plan for the Shanxi energy base which centers on coal, the loess plateau control plan, the Huang He Huai He Hai He control plan, and the development and utilization of coastal resources. Of course, specialized plans have a certain comprehensiveness.

Since the program for land planning is so broad in substance, do we still need a national economic plan when we have a program for land planning? The answer is yes. The program for land planning can form the basis of the national economic plan but cannot substitute it. Only on the basis of evaluating resources does it provide orientational views and a strategic pattern for economic development and distribution of productive forces. Although land planning can sometimes conduct feasibility studies on some major construction projects and can concretely implement projects determined by plans, the arrangement and construction schemes of these projects must be implemented in the national economic plan. All planned targets can only be made definite within the plan. If we say that the land planning program is a rough plan, then the national economic plan is a detailed plan. If we say that the national economic plan stresses the scale, pace and ratio of social and economic development, the land planning program stresses the development and utilization of resources, rational area distribution of productive forces, and a balanced ecological environment. Therefore, the land planning program is an indispensable work for the national economic plan.

The program for land planning and regional planning share much in common in terms of guiding ideology and substance, only regional planning in the past was primarily planning for industries and communications and the program for land planning is richer in substance and types. Regional planning can said to be a form of the land planning program. The formulation of the land planning program of an area can include the basic substance of regional planning.

III

The actual state of the nation is that all departments and trades have already carried out numerous plans. The formulation of a land planning program should fully use the foundation of these plans. In the course of formulating the land planning program we should revise and supplement departmental and trade plans in order to achieve harmonious development among departments.

Formulation of the land planning program for an area should generally include the work of defining the scope of the plan, putting forth the tasks and substance of the plan, making clear implementation steps and methods, and organizing corresponding organs of leadership. These can be centrally reflected in the work program (or plan) for the formulation of the planned program.

To determine the scope of the planned area, we must proceed from reality, consider the similar nature of natural conditions as well as the close relationship between economic and social relations. We must also suitably look after the integrity of administrative boundaries. The economic development of an area often does not stand alone but close ties are maintained with nearby areas. Therefore, the scope of planning may have the two concepts of basic scope and related areas. For example, the Beijing-Tianjin-Tangshan area maintains close,

internal ties, and is also the passageway for outbound coal from Shanxi and the energy resource base for the local area. Obviously, Shanxi can be regarded as a related area for the Beijing-Tianjin-Tangshan area.

The tasks and substance of a plan must reflect the conditions and characteristics of the area. The tasks and substance of a plan may vary drastically from area to area. But we must stress the major problems which strongly affect the area's economic development and ecological environment, make repeated investigations, comprehensively analyze and verify, and propose counter measures. We cannot attend to each and every aspect of a matter or try to attend to big and small matters all at once. Whether we can grasp the key point determines success or failure of a plan.

The steps in planning can be divided into two stages, preparation and planning. The preparation stage includes planning for formulation work, collecting basic source materials, launching scientific research and training planning personnel. The planning stage includes drafting the planned program, studying and formulating the specialized plan, proposing the scheme for the comprehensive plan, determining the short-term plan, and finally completing the formulation of the planned program. Unless there are special circumstances, preparation and planning should be carried out after approval by departments in charge at a higher level and after special leading organs are established. Otherwise, the collection of source materials and scientific research work will be full of difficulties. To assure close combination of scientific research and planning, we can unite scientific research units and administrative and professional departments. Scientific research units are primarily a research and planning profession, while administrative and professional departments primarily organize and coordinate. Each has its own emphasis and they supplement each other. The course of planning from beginning to end must pay attention to comprehensiveness. They should carry out specialized planning under comprehensive guidance and synthesize on the basis of specialized planning.

The formulation of a planned program is a task that touches on more than one department and one discipline, and the results of planning directly affects the interests of all departments. Therefore, it is necessary to have a strong leading organ. Planning that spans across provinces and cities should be led by state comprehensive departments, or the State Council should be requested to set up a planning commission. Planning within the scope of the provincial area can be led by concerned departments, otherwise a planning leadership group can be set up to lead and organize the work.

9586

CSO: 5000/4160

SUCCESS OF LAND MANAGEMENT TO REQUIRE MOBILIZATION OF POPULATION

Beijing DILI ZHIZHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 4, 1983 p 2

[Article: "The Vigorous Development of Popularization Work in National Land Management"]

[Excerpts] Two years ago, the CCP Central Committee and the State Council made a major decision in regard to national land management. This is a basic national policy that was proposed after socialist construction in our nation entered its new phase. It is related not only to the progress of establishing the four modernization and to realizing the great strategic goal of quadrupling the total industrial and agricultural output of China by the end of the century but it is also related to the well-being of future generations. For this reason, doing a good job of national land management is a great task that the people of the entire nation must undertake.

Geography is a basic academic discipline concerned with research on territory. For 30 years, geographers have done a great deal of work on territory such as comprehensive surveys, land utilization, agricultural districting, the distribution of industries and communications and transportation, regional planning and urban planning, with marked accomplishments having been made. Now, the CCP Central Committee has proposed making national land management a basic national policy and geography workers have been deeply inspired by this. Everyone has responded immediately, offering advice and proposing means, and undertaking tasks. It can be said that the development of land management work has created advantageous conditions for the development of geography and has opened up an even wider sphere in which geography workers can make greater contributions to the four modernizations. Nevertheless, national land management is a major task and is something that cannot be accomplished by a small number of people and for which all of the people must be mobilized in a common struggle if it is to be realized. For this reason, popularizing scientific knowledge about national land management as well as knowledge about developing, utilizing, administering and protecting land has become the unshirkable duty of geography workers.

National land management involves an immense amount of scientific knowledge and giving publicity to and popularizing land management in a wide-ranging and extensive way are urgent tasks. Basic knowledge such as the meaning and concept of territory, national land management and land planning; the nature, components and objectives of land planning; the relationship of land planning to regional planning, economic districting and river basin planning; and the application of comprehensive geographical analysis methods, methods of measurement and remote sensing techniques in land work must be explained.

Our nation's territory is of vast length and breadth, of diverse national conditions and of abundant resources. However, our nation has a large population and the amounts of various natural resources are not high on a per capita basis. For this reason, we must introduce scientific knowledge about the state of land resources in China, developing the special advantages of each region, utilizing and transforming nature, developing the economy and protecting the environment; through research on land resources in a few typical regions determine the relationship of development and utilization of natural resources (and energy in particular) to population growth, environmental protection and ecological balance; and raise the level of the people's ideological awareness through the summarization of historical experience and particularly of the lessons in such areas as economic development and ecological balance, and of the development and utilization and control and protection of natural resources over the more than 30 years since the founding of the nation are of great significance in developing land work and in realizing our strategic goal of quadrupling output.

As national land management work progresses, positive accomplishments will certainly be made in major research topics concerned with key point (experimental) control regions and geography. Introducing people to these development and control projects will be beneficial to promoting thorough development of land work throughout the entire nation. For example, development and utilization of major river system resources such as the Chang Jiang and Huang He and diverting water from the south to the north across river basins are major projects which everyone is paying close attention to. The Beijing-Tianjin-Tangshan region, the Songhua Hu region in Jilin, the Yichang region of Hubei, the Ningbo coastal region of Zhejiang, the Bayingele Mongolian Autonomous District of Xinjiang and the western districts of Henan, which are distributed over different natural regions and economic regions of our nation, are highly representative. Introducing the natural and economic characteristics of these regions, the key problems of development and restoration, strategic plans for comprehensive development and utilization, the arrangement of rational structures for industry and agriculture and the distribution of communication networks and development, utilization and protection of tourism resources will give impetus to the development of national land management work throughout the entire nation.

Economic districting with large cities as centers is an important component of national land management and planning. There are many cities in our nation with populations over 1 million people and each large city is an economic center. Introducing economic districting with large cities as centers, urban planning, setting up of satellite cities and towns and rational economic

structures bears a direct relation to the expansion of our nation's economy and to the personal benefits of the people.

The problem of urbanization in our nation is another research topic that cannot be neglected in national land management. For example, such questions as what sort of relationship exists between urbanization and the economic development of a nation, the development of urbanization since the founding of the nation, the mutual relationship between economic development and urbanization in China and city planning and rational distribution of residential areas in different types of regions are important issues in the new phase of socialist construction in the nation.

As we summarize our studies and experiences on land work, many good ideas and proposals will emerge. We must popularize these experiences and rational proposals so that they will be beneficial to the smooth development of national land management. At the same time, appropriate introduction of national land management of some of foreign countries can serve as a reference for national land management in this country and broaden our outlook.

10019

CSO: 5000/4165

RENMIN RIBAO URGES STRENGTHENING LAND CONTROL

OK021122 Beijing RENMIN RIBAO in Chinese 20 Jul 83 p 2

[Commentator's Article: "Strengthening Land Control Is a Task Which Brooks No Delay"]

[Text] At present, strengthening the work of land control is a task which brooks no delay.

This is first determined by China's basic conditions of a large population and little arable land. Although China is a country of vast areas, per capita land areas are not large, let alone per capita arable land areas. Moreover, there is a shortage of reserve resources of arable land. Because we failed to control population growth and the reduction of arable land for a period of time in rural and urban construction and development, the work of land control has become our weak point, resulting in the increasingly acute contradiction of a large population and limited arable land.

Since the founding of the PRC, we have, in our country's rural areas, continuously carried out capital construction of farm land centered on regulating rivers and improving the soil, built a large number of irrigation projects, renovated some 100 million mu of arable land, built a large number of fields with high and stable yields, and done a large amount of work in exploiting, improving, and using land, thus making great achievements. In some places, however, land resources have not been reasonably used and have instead been seriously undermined, resulting in loss of soil fertility, soil erosion, sandy land, pollution, and defective ecology. In the meantime, there have appeared in some places, mainly suburban areas of cities and towns with a large population and limited land, some illegal practices of renting, selling, and buying land, thus aggravating land waste and undermining social mood.

The above-mentioned various land waste and destruction have become a major hidden peril in China's rural areas. In the future, along with the development of the country's economic construction and the upgrading of people's livelihood, it is unavoidable that a certain amount of land (including arable land) will be taken over, and, in order to achieve the goal of agricultural development, an important strategic point, we must have sufficient land, arable land in particular. Such a state of increasing inadequacy of land use calls for our strong sense of responsibility and sense of urgency in the work of strengthening land control.

In some comrades' eyes, large buildings are property; factories and machines are property; grain and cotton are property; but land, on which all this property depends, is not property because it will not disappear. Hence, they neither treasure nor pay attention to land control. One reason is that they fail to understand the characteristics of land and the significance of land control. Marx held that land is the common and permanent property of all generations of mankind, that is, the living condition and the condition for reproduction which they cannot sell. He highly appreciated William (Pei di)'s famous remarks: "Labor is the father of property and land is the mother of property." Land is the basis on which people live and the resource of life. Land is precious in that it is limited.

Buildings and factories can be rebuilt, machines can be remanufactured, and grain and cotton can be regrown. But land cannot be reproduced and will become less and less. Furthermore, it is fixed and cannot be moved. This characteristic of land determines that we must strictly control it and properly use it.

At present, the crux of the land problem is the lack of unified scientific control. Scientific land control includes legislation, investigation, planning, registration, statistics, and approval and supervision for its use. It is an indispensable means to protect the public ownership of land, and to protect and make full use of land resources. Since the 3d Plenary Session of the 11th CPC Central Committee, the CPC Central Committee and the State Council have treated as a national policy the protection of arable land, and have taken a series of important measures to strengthen the work of land control.

At present, we must grasp the work of perfecting the land law and regulations and must, before the promulgation of the "land law," seriously investigate and handle the problem of illegally occupying land, and halt the unhealthy practices concerning land deals and building houses at the cost of farmland, in accordance with the existing land law and regulations. We must establish and perfect the organizations for land control, form a land control network from upper levels down to lower ones, cultivate a qualified professional contingent for land management, and completely and scientifically carry out the land control work. What is more important is that we must strengthen propaganda and education and raise the understanding of the vast number of cadres and masses on the important national policy of treasuring and properly using every inch of land. As the system of contracted responsibilities on the household basis with payment linked to output is now being carried out in rural areas, thousands upon thousands of households are thus faced with the problem of using scattered land. An urgent task for land control is to guide and help peasants to manage, use, and cultivate the land in a good manner in the fields of policy, goods, and technology. We must have a new land control method suited to the characteristics of the system of contracted responsibilities on the household basis with payment linked to output, so as to maintain the protracted stability of the rights for using land by land contractors and reasonable transfer of contracts, to encourage land investment by contractors, and to gradually upgrade the level of intensive farming of land. Meanwhile, we must, on the basis of an all-round plan, properly exploit and make full use of vast mountain areas, hills, grassland, rivers, lakes, ponds, and beaches so as to greatly upgrade the productivity of land.

Land control is something concerning the prime issue of the national economy and the people's livelihood. In China, it is also an undertaking we have just begun. Therefore, the whole country must attach importance to it and all trades must cooperate with each other. Only thus can land continuously create wealth to meet the people's needs.

CSO: 4010

LIAONING MAKES CONCERTED EFFORT TO PREVENT CONVERSION OF AGRICULTURAL LAND

Shenyang LIAONING RIBAO in Chinese 12 Jun 83 p 1

/Report by Tan Peichuan /6223 0160 0356/ Feng Wucheng /7458 2976 2052/:
"Strengthening Land Management and Protecting Land Resources; A Situation from
One of Confusion to One of Order Has Occurred in Land Management in Liaoning
Province"/

/Text/ The Ministry of Agriculture, Animal Husbandry and Fishery convened a meeting to exchange experiences on land management in Harbin during the end of May. While passing on experiences, the representative of the Liaoning provincial agricultural department said: In land management, Liaoning is beginning to change the "three confused situations"--confusion in the change of management organs, confusion in the exchange of personnel who hold concurrent posts and in the conversion of land everywhere and has stopped the unhealthy trend of indiscriminate approval, conversion and construction. Land conversion, either for urban construction or rural housing, has been reduced gradually. In 1982, 4,862 mu of farmland were saved from being converted to homes alone compared with the figure of 1981.

Industry is concentrated and the population density is high in Liaoning, the contradiction between overpopulation and lack of land is more prominent day to day. By 1981, the cultivated area decreased to 55.6 million mu from 71 million mu in the early period of liberation, and the average per person decreased from 3.9 mu to 1.6 mu.

In order to reverse chaotic trends in land management, the province first strengthened the establishment of land management organs. Commissions for land management have been set up at the provincial, municipal and county level, and committees or teams for land management have been set up in rural people's communes as well; 1,355 cadres have been assigned to this work. A sound system of land management has evolved from the higher to the lower levels. Two investigations were carried out on illegal occupation within the province, over 30,000 cases were discovered and seriously dealt with, and 25,407 mu of farmland were returned. In order to regulate land management "Liaoning Province's Provisional Regulations on Land Management" were issued in February of last year, bringing order to land management work.

Attention must be paid to the reform of villages and the conservation of land use. While cooperating with construction departments in planning the reform of villages, the land management departments at different levels kept old reforms in mind. Over 80 percent of rural construction provincewide were planned by adapting old measures, a great amount of farmland can be saved in this way alone.

12272

CS0: 4008/155

STRICTLY CONTROL USING FARMLAND FOR CONSTRUCTION

Shenyang LIAONING RIBAO in Chinese 5 May 83 p 2

[Article: "Manage Land Like Controlling Population"]

[Text] Land is the root of man's survival and the source of life. Our national policy is to value every inch and utilize it rationally. Nevertheless, this point has not been generally understood even today. Take Chaoyang Prefecture for instance: Some cities and towns, communes and brigades use enormous areas of land for capital construction, and the practice of building houses indiscriminately on farmland is even more widespread. To get married, some young people follow the practice of "registering first and building a house next; occupying the land first before welcoming the bride." The area of farmland has drastically dwindled and the population grows ever larger, aggravating the contradiction between the two. After a number of years, a "farmland crisis" is bound to emerge. It is a major issue involving the overall situation and national survival. There is the necessity to raise a cry of warning: Like controlling population, we must strictly control the use of farmland.

In 1957, Chaoyang Prefecture had 10.01 million mu of farmland. Starting from 1958, the area dwindled year after year, dropping to 7.5 million mu by last year, a net loss of 2.51 million mu in 25 years, averaging close to 100,000 mu annually. Conversely, population increased year after year. In 1957, the total population of the prefecture was 2.356 million, but it increased to 3.446 million by last year, an increase of 1.09 million in 25 years, averaging 43,600 annually. The decrease and increase have aggravated the contradiction between land and people. In terms of average farmland per capita, it dropped from the 4.24 mu of 1957 to 2.2 mu last year, a reduction of 2.04 mu per capita. Computed according to the proportion of land reduction and population increase, every 2 mu taken away from the farmland throughout the prefecture is equivalent to adding 2 persons.

Obviously, while population control is important, controlling the use of farmland is just as important.

The drastic reduction in the area of farmland has produced changes in its compositional proportions. Among the 21.9 percent of the total area of the prefecture which is arable, level and fertile land, garden plots and paddy fields constitute only over 20 percent, the remainder being hilly and barren. The massive use of farmland for other purposes has not only reduced the area, but caused changes in the compositional proportions in quality. Whether building in urban or rural areas, the land used is usually fertile fields and vegetable farms in city outskirts, townships, villages and hamlets. Chaoyang commune of Chaoyang city, for instance, had 45,000 plus mu of farmland in 1957 when the city was first established, but by the end of 1982, state, commune and brigade, and commune member constructions had used over 20,000 mu, and 90 percent of it consisted of fertile fields and vegetable farms. The farms of four vegetable teams were completely wiped out. Today's farmland is mostly new vegetable farms of poor quality and low output. The massive use of fertile farmland not only directly influences the development of the agricultural economy, but inevitably leads to the dislocation of the farmland compositional proportions and ecological balance. It is an issue calling for serious attention.

Agriculture is the basis of the national economy and its high-speed development the basic condition to guarantee the achievement of the four modernizations, while land is the foundation of agriculture. Therefore, valuing every inch of land, especially farmland, is an urgency. It is also determined by the characteristics of land itself. First is its finite. The land of a commune, a county, a prefecture, and even the country as a whole is limited, possessing neither the capacity to regenerate, nor replaceable natural resources. Next is its broad sense. It is the most basic means and condition for man's production and living. These characteristics make it imperative for us to adopt measures against waste and use it rationally, and consider conserving every inch the basic national policy.

We must implement the land management regulations and establish and strengthen the systems. The various management systems must be adjusted to the need of urban and rural construction as well as today's situation of reform. Making rationally utilizing land resources and cherishing farmland an important part of the overall balance and the measure of the economic results in the national economy through the management systems, we must reform the systems and raise the land utilization rate. We must extensively and intensively propagandize and implement the "Management Regulations on Land for Housing Construction in Villages and Townships," "Regulations on Land Requisition for State Constructions" and "Provisional Regulations on Land Management in Liaoning Province" promulgated by the State Council. Besides firmly implementing the provisions in the "regulations" and "announcements," every county, commune and brigade must, in line with the practical local conditions, formulate its own land management systems and methods and standardize, systematize and democratize land management. We must, in connection with the national, provincial,

county and commune conditions, launch an ideological education on cherishing land and form a new trend among the broad urban and rural cadres and masses to value land and avoid waste.

While strictly controlling the use of land for state capital construction, we must also vigorously manage the use of farmland for urban and rural housing and the building of small townships. The effective measure to control land use rests on the proper construction planning of market towns and new villages. The layout must be rational and the structure compact, minimizing the use of farmland. In planning for market towns and villages and hamlets, we must give first place to remodeling the old areas, fully utilize wasteland, slopes and hillsides, adjust to local conditions, minimize the use of farmland and refrain from "housing" at the expense of "food." While creating and strengthening land management organs, we must establish stringent examination and approval systems, so that all regulations are observed, all laws are obeyed, laws are strictly enforced, and someone is responsible at every level and for everything.

One important link in land management and utilization is to properly handle agricultural capital construction, maintain the ecological balance, closely integrate planting, forestry and livestock, conserve water and soil and achieve a benign cycle. These are the long-range plans to protect farmland resources.

6080

CSO: 5000/4173

TAI HU BASIN DEVELOPMENT ON ECOSYSTEM URGED

Beijing XITONG GONGCHENG LILUN YU SHIJIAN /SYSTEMS ENGINEERING---THEORY AND PRACTICE/ in Chinese No 1, Mar 83, pp 8-11

/Article by Xiong Yi /3574 3015/ of the Nanjing Pedology Institute of the Chinese Academy of Sciences: "Study on the Development of the Tai Hu Basin From the Viewpoint of Artificial Ecosystems"/

*This article was received on 8 June 1982

/Text/ The management of national land or the development and utilization of a region must apply the theories and methods of artificial ecosystems to study specific problems and the relationship between problems, and establish practical and feasible development plans before man's initiative can be fully developed, and before one can regulate, control and build a good ecological system.

The Tai Hu Basin is a complex regional artificial ecosystem. It includes many subsystems, such as the systems of farmland ecology, lake ecology, town ecology and economic ecology. These subsystems are all mutually linked. Therefore, research on the development of the Tai Hu region must regard the Tai Hu region as a whole, and it must separately study the structure, function, evolution and relation of the subsystems. Only by clearly understanding the condition of each subsystem and their relation can we study and establish a strategy for the development of the entire region. With a general principle for developing this region, we can separately study and establish plans for improvement and construction of each subsystem and thus build the Tai Hu Basin into a rational and good ecological system.

I. Characteristics of Artificial Ecosystems

Ecology is not just a science that explains natural laws, more importantly, it is a discipline that provides realistic and concrete solutions for national economic construction. Ecology is a study of the relation of organisms to their environment. During the middle of this century, the ecosystem became the basic unit for ecological studies and it was believed that it had become a real entity precisely specified in time and space. Ecology not only studies the organisms living in this real entity, it also includes abiotic natural conditions, and studies the interaction between different organisms and between organisms and natural conditions.

An artificial ecosystem is the same as a natural ecosystem. There are large and small systems. Every system is a network consisting of various components. The ecosystem is not a simple sum of the components but a product of each component interacting. The natural ecological system consists mainly of natural factors of organisms and nonliving substances; the artificial ecosystem not only consists of natural factors but also social and economic factors and human activity. Each of these three has its own structure, function and evolutionary laws, and they must be studied from the viewpoint of the whole and the system. At the same time, there is a very close interaction among these three types of components in forming a complex and variable artificial ecosystem.

Natural factors include biological factors and abiotic factors. Social and economic conditions include social situations, economic situations and political factors (policies). Human activity includes human existence, life and productive labor, and intelligence. These three components can also be said to be three types of systems that are very complex and vary from place to place. The structure and function of these three systems vary in different nations or different regions. Artificial ecosystems not only study the structure and function of each system, they also study the relation among these three components, i.e., the interaction among natural conditions, social and economic conditions, and human activity.

At present, development in ecology has entered the stage of studying humans and the biosphere, man's control of the biosphere, and human responsibility for the evolution of the biosphere is a pressing issue that needs to be considered. As human society develops, the greater man's interference in the natural environment, the more visible the role of man in the ecological system. Man not only is an important part of the ecological system, he is the center of the ecological system. The system emphasizes man's leading role. The function of the system is mainly determined by man's intelligence and the degree of development. This type of ecosystem centered around human activity is called the artificial ecosystem.

Rice and wheat were planted in the Tai Hu Basin as early as 6,000 years ago. The ecological system of this region was formed over a long period of human activity. The structure and function of this system have been subjected to human interference and changes are frequent. The input and output of materials and energy increase year after year, and the input and output of energy and materials grows as society, and science and technology develop. If there are poor social and economic conditions, and if no one is adept at management, the system will become imbalanced.

Facts tell us that as society develops and as the level of science and technology continues to rise, the demands and the ability of humans to develop and use natural resources become greater; therefore, the conflict between the utilization and destruction of natural resources and the conflict between the development of industry and mining and pollution by the three wastes also worsen day by day and directly affect the change in the ecological system. Therefore, an artificial ecosystem must include human activity and social and economic conditions. A good ecosystem can be built only by an overall consideration that conforms to natural laws and economic laws.

II. Regulation and Control of an Artificial Ecosystem

The ecological system is always in motion and changing, and undergoes cycles of material exchange and energy conversion. But in the structural network of the ecological system, every link affects and limits the other. Therefore, maintaining a fixed state of stability within a definite period, or a balance among the dynamic processes is ecological balance. The ecological system can maintain a dynamic equilibrium because when any link in the network breaks down, the other parts can coordinate and compensate for the breakdown. This is self-regulation in an ecological system. The regulatory ability of an ecological system is determined by the structure and the function of the system. The more components an ecological system has, the more complex the flow of energy and materials. The stronger the self-regulatory ability of a system, the easier it is for the ecology to maintain a balance. But this balance is relative, temporary, conditional, and any change in natural factors or human activity can disrupt this balance. Yet, ecological balance is not absolutely variable or inviolable. The old ecological balance and the low level of ecological balance must be improved. Through rational human activity we can make the ecological system develop in a good direction, and build a new ecological balance that is high yielding, of superior quality, low consumption and beautiful environment. Conversely, irrational human measures will not only be unable to maintain the original ecological balance, they will also cause the ecological system to deteriorate. What we need is an active ecological balance that has initiative, not a passive and inactive balance. We must establish the best ecological system suited to the nation's conditions through artificial regulation and control based on the characteristics of the ecological systems of different areas.

What we call "regulation and control" means to regulate and control the structure and function of ecological systems. The improvement of the structure and function of a system is not done once by regulation but by "feedback regulation." Feedback regulation is to take the results obtained by the regulations already implemented as the basis to determine and modify the next regulatory function so that the system can adapt to the external environment that has already been changed. The mutual adaptation and feedback regulation of a system is modern cybernetics. Regulation includes self-regulation and partial artificial regulation, and control consists of an imperative nature.

Regulation and control of a system are the most active core in developing production. They are the central tasks in studying artificial ecological systems. The regulation and control of a system include the rational utilization of natural resources and the development and conservation of energy so that agriculture, industry and commerce can develop comprehensively and national land can be managed. We must continue to solve existing problems in the different artificial ecosystems. We must solve the conflict between man and land, between cities and rural areas, between industry and agriculture according to the principles of system regulation and control, and we must exert efforts to make social and economic conditions coincide with the requirements for a balanced regional development.

Regulation and control of a system are not only suitable for use in the entire regional ecological system, the subsystems of towns, farmland, lakes, water

networks should also be regulated and controlled according to the requirements of the system. The development of a region must be based on the characteristics of the ecological system, we cannot consider only natural conditions. We must also consider social and economic conditions, we must regulate and control the structure of the entire artificial ecological system, study whether the conversion of energy and the material cycles are rational or not, regulate and control the input and output of materials, and create the best artificial ecological system.

Because the social and economic conditions and the level of science and technology at each locality are different, the quality of the artificial ecological systems are different. Any region that wants to realize modernization must take different and appropriate measures based on the actual condition of the ecological system and improve the efficiency of the ecological system. Therefore, the efficiency of regulation and control of a system can also be an indicator of modernization.

III. The Question of Developing the Tai Hu Basin

The natural conditions of the Tai Hu Basin are superior. The culture and economy are developed. It is an important production base for agricultural, industrial and commercial products in China. Cities and towns are densely distributed; it is a center of thriving industrial and commercial enterprises and a world famous tourist attraction. For more than 30 years since the founding of the nation, the economy of this region has grown rapidly and has contributed greatly to the state. In general, the ecological system of this region is good and we must affirm this. But as society and the economy develop, some new situations and new problems that need to be studied have emerged.

The fluctuation in grain production has been great, diversification has not been commensurate. These are the major problems faced by agriculture in the Tai Hu Basin at present. In recent years, the output of grain in the Tai Hu Basin has generally dropped. There are many reasons, but the most important one is how to arrange agricultural production according to natural laws. A rational planting system should fully and rationally utilize light, heat, water, soil and a variety of resources. It also must suit economic benefits. Yet in actual practice, many measures surpassed the objective possibilities and were punished by nature. Development of diversification is an important way to bring into play the multiple functions of natural resources, and it is an effective measure to improve the economic benefits of the masses. The Tai Hu Basin has good natural conditions for the development of diversification, but it lacks overall development plans that suit measures to local conditions.

The utilization of lakes and water network resources is insufficient, the productive potential has not been developed fully. The total area of the lakes in the Tai Hu Basin is 5,800 square kilometers. Water resources are abundant. They not only can provide water for fishery, industry, agriculture and shipping, they can also regulate the climate, and prevent damage by drought and water-logging. But because of some human factors, at present, the lake area of Tai Hu has shrunk, the rivers flowing from the lake are mostly silted, the ability to prevent floods has been weakened, and the regions in the lower reaches frequently

are damaged by waterlogging. Also, the ideological guidance of emphasizing agriculture and neglecting fishery, and creating farmland around the lake have reduced the area for cultivation and silted the fish spawning grounds in east Tai Hu. With overcatching of fish, the quality and fertility of the water have dropped affecting fishery production.

Construction of cities and towns and industrial development lack rational planning, the distribution is chaotic affecting the development of economic benefits. The Tai Hu Basin has a total of 971 cities and towns above the level of commune and market town. It is a region with the highest density of towns in the nation. Because of a lack of scientific planning, the distribution is very chaotic. Cities along the Hu-Ning Railroad seem to be connected. There is a lack of scientific proof of the direction of urban development and internal economic structure, and this has created a scattered industrial distribution. Administrative zones, industry and commerce, scientific and cultural establishments cross into each other and the structure is irrational. Unplanned development has caused confusion of the water systems in cities and they have lost their function. There is an extreme shortage of land for utilization, and the area of agricultural land occupied by industry is increasing day by day. Because of overextraction of groundwater, the ground surface has settled. At present, the density of the urban population is high and the capacity of cities has reached saturation.

Environmental pollution is becoming more serious, and is affecting people's health and the tourist industry. Because industry has developed without planning, and most industries are simple and indigenous and because most of the "three wastes" are released without treatment, cities, farmland, lakes and rivers have all been polluted to varying degrees. Organic chlorine has been detected in animals and birds and people in some areas.

The development of commune and brigade industries has caused a change in the rural economic structure and has brought about some new problems. At present, benefits from rural industries in the Tai Hu Basin are greater than agricultural benefits, and the life of commune members has been greatly improved. But the prices of agricultural products are irrational, the price of grain is lower than that for cotton and oil crops. "Grain is cheap and this hurts agriculture." At present, farmers commonly neglect agriculture and emphasize industry and sideline production. This is very unfavorable to grain production.

The emergence of the above problems in the Tai Hu Basin is mainly due to poor management and weak measures. There is a lack of scientific analysis and correct understanding of the local situation and the whole situation, the present and the future, natural laws and economic laws. There is also a lack of regional development plans that take the entire situation into consideration. Therefore, many measures have violated natural laws and economic laws, causing the ecological environment to change for the worse and hindering the development of the Tai Hu Basin. These problems are very complex, they are related and interact. The task of solving these problems can no longer be done by a certain department or a certain academic and scientific institute. We must use the viewpoint of artificial ecosystems to carry out comprehensive study and management. The Tai Hu Basin is a complete ecological system consisting of farmland,

lakes, water networks, towns and other subsystems. In the entire system, there are pollution problems, water system problems, conflicts between urban and rural areas, conflicts between agriculture, industry and commerce, and there are also complex problems in the social and economic structures, etc. We must study in depth the laws of change in the development of each subsystem and the role and effect they have in the large system, we must also use material flow, energy flow, human activity, and economic exchange to laterally analyze the relationship between the subsystems. Only on this foundation can we consider the problem of development of the Tai Hu Basin on an overall basis.

The problem of developing the Tai Hu Basin cannot be borne by a few academic and scientific institutes and it cannot be solved by relying only on scientific research departments. We must wage a joint battle by many disciplines and with many "branches" of service. But different disciplines vary in their methods of work. There will be difficulties in fighting together. We can first organize related disciplines, gather data and study the problems. After we gain some insights we can then join other disciplines and business units to discuss together and to carry out "consultation." Although the problem of the Tai Hu Basin is very complex, if we can organize many disciplines and many services to overcome the difficulties jointly and conduct repeated discussions, then we can propose "prescriptions" for the development of the Tai Hu Basin on the basis of understanding the "conditions" and provide the information to the government's decisionmaking departments for reference.

9296

CSO: 5000/4151

ENVIRONMENTAL PROBLEMS OF THE BOYANG LAKE AREA ANALYZED

Beijing RENMIN RIBAO in Chinese 22 May 83 p 3

[Article by reporter Chen Quanbi [7115 3132 3880]: "We Should Pay Attention To Harnessing the Boyang Lake"]

[Text] Boyang Lake, which was called Peng Li in ancient times, is the largest freshwater lake in China. It is located in the northern part of Jiangxi Province, on the middle and lower reaches of the Chang Jiang. The people of Jiangxi Province call it a rich storehouse for three things--grain, water and fish.

Boyang Lake is 110 kilometers long from north to south, 70 kilometers wide from east to west and 600 kilometers in circumference. It connects Jiangxi's five rivers--the Gan, Fu, Xin, Bo and Xiu--forming the complete Boyang Lake water system, which irrigates the vast expanse of fertile farmlands in Jiangxi Province.

The Boyang Lake Economic Zone, which is being planned by Jiangxi Province, includes 25 counties and cities (covering an area of more than 39,000 square kilometers), 13.38 million mu of cultivated land and 11.72 million people. The Boyang Lake area occupies a key position in the economic construction of Jiangxi Province.

Moreover, Boyang Lake is a large natural reservoir. Its storage capacity is 28.9 billion cubic meters, 1.6 times that of Dongting Lake, 5.7 times that of Tai Lake, 11 times that of Hongze Lake and 78 times that of Cao Lake. Its function is storing, discharging and regulating floods on the middle and lower reaches of the Chang Jiang. The amount of water annually emptied into the Chang Jiang by the Boyang Lake water system, which includes the five rivers of Jiangxi Province, is 145.8 billion cubic meters, surpassing the total amount of water emptied into the ocean by three rivers--the Huang He, Huai He and Hai He. Boyang Lake is Jiangxi Province's water transport center connecting the Chang Jiang. Millions of tons of cargo is handled on the lake every year.

However, during a relatively long period of time, errors in the guiding ideology and economic policies for utilizing Boyang Lake, especially the influence of the "leftist" errors in the 10 years of internal disorder, have caused Boyang Lake a series of problems.

One of the problems confronting Boyang Lake is that the surface of the lake is getting smaller and smaller each year as a result of building dikes to reclaim land from the lake. The surface of the lake, which is believed to cover 8 million mu, has been reduced to over 5 million mu as a result of mistakenly advocating "blocking water to seek grain" and "reclaiming land from lakes." According to statistics, during the 22 years from 1954 to 1976, nearly 2 million mu of land was reclaimed from the lake, equivalent to a one-fourth of the lake's surface. Because the lake's surface is smaller, its capacity of storing, discharging and regulating floods is also getting smaller, and the threat of flooding in high-water seasons is becoming greater each year. Reclaiming land from the lake has also disturbed and destroyed migratory routes of fish, affecting the reproduction of fish. Fish in Boyang Lake all have certain living habits and migration patterns. Before the large-scale reclamation of the lake, the southern part of Boyang Lake had 31 fish spawning grounds and 500,000 mu of water surface as fish habitats; now there are only 8 spawning grounds and 140,000 mu of fish habitats. Some rare species of fish that migrated from the ocean no longer breed in Boyang Lake because their migratory routes are blocked. Moreover, the reclamation has also blocked the original navigation channels and forced ships to go around or use new channels, increasing the shipping distance and costs of transport. The economic results of state farms built on land reclaimed from the lake cannot reach the designated level because of the huge investment and lack of scientific operation and management.

The second problem confronting Boyang Lake is soil erosion and vegetation destruction. The forest cover of the Boyang Lake area was not large to begin with--the whole area had only 9.86 million mu of forests and 16.8 percent of forest cover rate, and some counties had only 1.4 percent. During the 10 years of turmoil, wanton deforestation was very serious owing to poor management of forests. In recent years, because the fuel problem is still unsolved in the lake area, the masses now and then fell trees and use them as firewood, increasing the seriousness of soil erosion. According to statistics, about 21.24 million tons of drifting sand are annually carried into Boyang Lake by the five rivers in Jiangxi Province. Of this, 11.54 million tons are carried into the Chang Jiang and some 10 million tons are deposited in the bottom of Boyang Lake. According to the prospecting surveys of Jiangxi's scientific research departments, the lake bed rises by 2.3 millimeters every year. Based on this speed, Boyang Lake--now a network of rivers--will become a desert area in a certain number of years from now. Due to the alluvial sand and mud, a sand dune in Wucheng Area which was called the "five hundred steps" in the early period of the liberation has now become the "eight star sandbar." Due to serious soil erosion, the soil fertility of Boyang Lake area is decreasing annually. This has to adversely affect crop production in the lake area.

The third problem confronting Boyang Lake is irrational and indiscriminate fishing which results in reduction of aquatic products. Boyang Lake is a large natural fish pond. Its aquatic resources depend on natural reproduction. Therefore, rigid restrictions must be imposed on fishing in the lake to ensure that only adult fish are caught and young fish are protected. At present,

some fisheries only pay attention to immediate interests. They use large nets with small holes which not even young fish can escape from. According to a recent investigation conducted at fishing grounds around the Yongxiujishan and Songmenshan areas, 92.3 percent of the 2,228 jin sample fish each weighed less than 5 liang. On average, catching 1 jin of adult fish will lose 274 young fish. Hilsa herring used to be a precious fish in Boyang Lake. But it is now almost extinct. Destroying snails with chemicals and pollution caused by pesticides and industrial liquid waste constitute another major factor affecting aquatic production. According to statistics, Jiangxi Province daily discharges 3.5 million tons of industrial liquid waste, of which, 2,915,400 tons is discharged into Boyang Lake. The amount of pesticides used in the province is also large. The pesticides carried into the lake along with rain will affect the life of fish. Destroying snails with chemicals also results in the death of many fish.

Destruction of grass land, difficulty in grazing and fuel shortages constitute the fourth problem confronting Boyang Lake. Islands covered with grassland in the middle of Boyang Lake are ideal places for interplanting crops and grazing. These islands submerge during the high water season and emerge during the dry season, like oases floating in the lake. People praise them by saying, "the islands which cover the lake with grass are a treasure of ours." During the 8-month dry season, these islands can be used to interplant crops such as late rice, barley, rice, wheat and rape. These islands have abundant forage grass, enough for peasants in the lake area to raise 200,000 head of draft animals every year. When winter comes, the grass withers and the peasants can dry it and use it as fuel. The grass can also be composted into fertilizer. These islands used to cover 3 million mu of Boyang Lake but now, they cover only about 1 million mu as a result of reclamation. This has increased the difficulty of peasants in grazing livestock and finding fuel and fertilizer resources.

The fifth problem confronting Boyang Lake is increasing instances of schistosomiasis. Since the founding of our country, central authorities and Jiangxi Province have put a large amount of manpower and materials resources into the prevention work. The occurrence of schistosomiasis was once basically brought under control. However, because of poor management and supervision and because the number of fishermen has increased in the lake area, the number of schistosomiasis patients, especially acute cases, has increased. According to statistics, the number of acute schistosomiasis patients was 274 in 1976, 649 in 1979 and 1,507 in 1980, an increase of over 4 times in 4 years. The area affected by schistosomiasis originally covered 34 counties and cities in Jiangxi Province. To date, 22 such counties and cities have wiped out the disease. Of the remaining 12 such counties and cities, 10 are in the lake area. This shows that the task facing the lake area in trying to prevent schistosomiasis is still very arduous.

Party and government leaders of Jiangxi Province and scientific research departments have formulated the "multipurpose investigation plan for the Boyang Lake area" after comprehensively appraising the economic value of Boyang Lake and its role in the national economic construction of the whole province, thoroughly

studying its various problems and its proper role in the four modernizations and conducting full deliberations and repeated studies. They are planning to eventually work out a plan for the comprehensive development and utilization of Boyang Lake on the basis of investigation and studies. They think solving the Boyang Lake problem has become a top priority. The principle they set forth for this problem is "unified leadership, overall planning, comprehensive development, taking all factors into consideration, seeking profits, avoiding losses and bringing benefits to future generations."

Jiangxi Province has now established the "leading group for a multipurpose scientific investigation of Boyang Lake," and appropriated 2.5 million yuan for an investigation fund. "The multipurpose scientific investigation teams" have already been established, and over 100 subjects of investigation have also been mapped out. Party and government leading comrades of Jiangxi Province contend that solving the problem of and developing Boyang Lake is of vital importance to Jiangxi Province and the whole country. They contend that the task is very arduous, they need to rely not only on scientific and technical personnel of their own province but also on the help of scientific and technical forces from all localities in our country. They hope that they have the wholehearted support of all related central authorities and the vigorous assistance of all neighboring provinces, municipalities and autonomous regions. They warmly welcome experts and scholars in related fields and specialists in various fields to come to Jiangxi to help solve the problem and develop Boyang Lake.

12302

CSO: 5000/4169

COASTAL ZONE MANAGEMENT LAW BEING DRAFTED

OW191457 Beijing XINHUA in English 1442 GMT 19 Jul 83

[Text] Beijing, July 19 (XINHUA) -- China will institute a law for conserving and rationally developing natural resources and protecting the ecological environment in the coastal strip, it was announced at a meeting here today.

A national group responsible for drafting the coastal zone management law was formed at the same time on the authority of the Standing Committee of the National People's Congress and the State Council.

The 23-member group is headed by Yan Hongmo, deputy director of the State Bureau of Oceanology, with oceanologist Ren Mei'e as its advisor. Members come from 13 units including the Ministries of Agriculture, Animal Husbandry and Fishery, Communications, and Light Industry. Representatives from coastal provinces and universities are also included.

At the first meeting of the group which opened today, Yan Hongmo said that in China, the coastal zone refers to the strip lying between a line on the land 10 kilometers from the seashore and the bathymetric contour at a depth of 15 meters. It covers various geographical forms with rich resources, such as seabeaches, shallow seas, river mouths, bays and marshes.

Densely populated, the zone sees the busiest human activity and, therefore, its ecological environment is most susceptible to damage. Investigations have shown that more than half of the marine pollutants are concentrated in such zones, he added.

With the expansion of China's economy and construction, he went on, the effort to develop the zone will take on an ever larger scale and contradictions among various sectors of the economy will grow.

Yan Hongmo noted that the new law is designed to deal with three aspects of coastal zone management: conservation of the coast, including delimitation of conservation areas, construction and protection of sea walls, prevention of serious coastal calamities, and rescue operations; management of coastal projects, including mediation in disputes over use of land in the construction of harbors, municipal works, nuclear power stations, etc., control over the development of the tidal zone for breeding aquatics, reclaiming land, making salt or growing reeds.

The new law is expected to be ready by 1986, the deputy director said.

CSO: 4010/91

ABILITY OF WATER RESOURCES TO KEEP PACE WITH QUADRUPLD PRODUCTION INVESTI- GATED

HK230623 Beijing HONGQI in Chinese No 11, 1 Jun 83 pp 36-39

[Article by Wang Changsheng [3769 7022 0581]: "Quadrupling and the Question of Water Resources"]

[Text] Water is the source of all life. Man's origins, existence and development are all intimately linked to water and all of mankind's production and social activities depend on water. Without water there would be no history of civilization and there would be no way that present society could exist. The importance of water is understood by everyone. What needs to be studied today is what the requirements of water resources are for achieving the glorious target as outlined in the 12th CPC Congress, to quadruple industrial and agricultural production value by the end of this century. What measures and policies should be adopted in relation to water resources? This article makes a few preliminary investigations into these questions.

The Characteristics of Water Resources

In comparison with other natural resources, water resources have the following characteristics:

1. Water is a replenishable natural resource. Water resources are not like oil, coal and other mineral resources. Coal exists in specific amounts and coal deposits diminish as the extent of coal exploitation increases. Water resources are replenished every year through the hydrology cycle and thus water can be used forever. However, water resources are not like lumber and aquatic resources, which can be constantly increased through afforestation or human cultivation. The total amount of rainfall in the world is about the same every year. According to statistics published by the UN Water Committee, annual average precipitation throughout the surface of the whole world is 800 mm and the total amount of rainfall measures 119,000 cubic kilometers. In China annual total precipitation measures 6,000 cubic kilometers, making up 5 percent of the total world precipitation. Average precipitation in China stands at 630 mm, lower than the world average. Although the quantity of precipitation varies annually, over a period of years there is a constant.

2. There is a great deal of salt water and little fresh water. Throughout the world there are vast oceans and seas and many rivers, lakes and streams. Seventy percent of the earth's surface is covered with water. What an abundance of water resources! This gives one the impression that water resources are truly inexhaustible. However, most of this water is salt water and the amount of fresh water is very small. The total volume of water on the earth is 1,385,980,000 cubic kilometers, of which sea water makes up 97.3 percent and fresh water 2.7 percent, and the total volume of exploitable fresh water is 3 million cubic kilometers, representing around 0.2 percent of the total volume of water on earth. China has coastal regions on the Bo Hai, the Yellow Sea, the Eastern Sea and the South Sea and most of China's water is sea water.

3. There is a great deal of evaporation but little runoff. When it rains, snows or hails, most of the water is lost through evaporation and little ends up as runoff. The total volume of water which evaporates on the earth every year is around 72,000 cubic kilometers, around 60 percent of total annual rainfall. Runoff totals around 47,000 cubic kilometers, around 40 percent of total rainfall. The situation in China is also like this, with annual rainfall of 6,032.2 billion cubic meters and 2,614.4 billion cubic meters of runoff, making up 43 percent of total rainfall, while the other 57 percent is lost in evaporation.

4. Water resources are not well suited to being transported long distances. Water is different from energy. Electricity can be transported from a power station to distant towns and villages by means of high voltage cables; coal and oil can be transported by rail, road, water and pipeline, thus allowing it to be brought from the production area to the consumer area. Consumption of water is enormous and according to statistics the annual amount of water used in China in industrial production and daily living reaches 57 billion cubic meters, and in terms of weight this is equal to 570 times the annual production of oil and more than 80 times the annual production of coal. Using trains, lorries and ships to transport water is thus completely pointless. Transporting water by means of irrigation ditches and underground pipes is technologically feasible but is economically expensive. For example in 1981 Tianjin decided to "extract water from the Yellow River to help Tianjin" and set up a water transportation line 800 kilometers in length, which flowed all the way to Tianjin with each ton of water from the Yellow River costing 1 yuan. Thus, in general, water resources are best suited to local exploitation.

In comparison to water resources in other countries, China's water resources have the following characteristics:

1. A great deal of water is lost and the amount of water that can be used is small. This is because: a) Periods of precipitation are very concentrated and 60 percent of annual precipitation is concentrated in 3 to 4 months during summer and autumn. During every wet season there are torrential rainstorms and rivers become swollen and overflow and the surging river waters flow for hundreds of miles until they empty into the sea and mix with the salt water; b) water storage capacity is limited and it is not

possible to store most runoff water and we can but watch helplessly as the valuable fresh water disappears and is lost. Since the founding of New China, 86,000 large, medium and small-scale reservoirs have been built and 6.4 million dykes and dams have been constructed, creating a total water holding capacity of more than 400 billion cubic meters, but this only represents 15.3 percent of all annual runoff in China and thus most water is lost.

2. Absolute quantities of water are large, but average amounts per person are small. China's water resources on land total 2,614.4 billion cubic meters, making our water resources very abundant, fifth in the world after Brazil, the Soviet Union, Canada and the United States. However, on an average per person basis, each person in China only has 2,700 cubic meters and, with China's population making up one-fourth of the total world population, it places China 17th amongst the 18 countries richest in water resources.

3. There is a great deal of water in the southeast, but little in the northwest. There are enormous differences in precipitation distribution in China and in general most occurs in the southeast and little in the northwest, with the amount of precipitation dropping as one moves inland and northwest from the southeastern coastal regions. In areas surrounding the Chang Jiang, the Pearl River, in Zhejiang, Fujian, Taiwan and all the various river regions of the southwest, there is abundant rainfall and thus rich water resources. The total volume of water in these regions makes up 82.2 percent of all water in the whole country. The Yellow River, Huai River, Hai River, Luan River, and Liao River, as well as Heilongjiang and the northwestern river areas, are areas of low rainfall and drought. The total volume in these areas makes up 17.7 percent of China's total, while cultivated land in these areas represents 63.7 percent of all such land in China and 46 percent of China's population inhabits these. Thus with little water, a large population and a great deal of cultivated land, the contradiction between supply and demand is very obvious. This is especially true in the Yellow River, Huai River and Hai River valley regions where the total amount of water only amounts to 5 percent of the entire country's runoff and where 30 percent of China's population lives and 37 percent of China's cultivated land is to be found. Thus the average person's water usage equals only 451 cubic meters (about one-sixth of the national average per person) and each mu of cultivated land only has 243 cubic meters of water, thus proving how tight water resources really are.

4. Distribution of underground water resources is very uneven. China's underground water resources total around 700 billion cubic meters per year, making them very abundant. However, in terms of distribution, areas with a great deal of surface water are also rich in underground water resources while areas poor in surface water are also poor in underground water resources. The Chang Jiang and the land to the south of it represent around 70 percent of it and the northern regions make up a little bit over 30 percent. The four provinces of Shanxi, Hebei, Shandong, and Henan represent one-fourth of China's total cultivated land and yet together they only have 70 billion cubic meters of underground water, representing 10 percent

of the total. There are rich underground water reserves in the flatlands and the Songliao Plains, Sanjiang Plains and the plains on the northern foot of the Tianshan Mountains which together make up 16 percent of China's total land mass, 29.4 percent of all underground water reserves. Of all underground water reserves only about one fifth to one third can actually be exploited which is rather limiting.

The Realization of the Quadrupling of the GNP Will Bring an Enormous Increase in Water Consumption

Water is an important material requirement without which industrial and agricultural production could not function. By the end of the century, the value of industry and agricultural output will have quadrupled and production will have developed greatly and thus there will have been great improvements in the people's living standards. At the same time, water usage will also inevitably increase by an enormous amount.

In recent years, water consumption in agricultural irrigation has been about 400 billion cubic meters per year, representing around 84 percent of total water consumption. In the future, irrigated land is going to expand and thus water usage will increase. On the basis of irrigation planning forecasts in all provinces, cities, autonomous regions and river valleys, by the year 2000 the entire country's water consumption for agricultural irrigation will have increased to 541.8 billion cubic meters of water, an average annual increase of 1.77 percent. At present, rural animal, livestock and various other water consumption areas use around 11.4 billion cubic meters of water per year and by the year 2000 this usage will have increased to 37 billion cubic meters per year, an annual increase of 11.2 percent.

At present, industry consumes about 50 billion cubic meters of water, 11 percent of all water consumption, of which thermal power stations use about half. If we look at the present overall average quotas for water consumption in industry and consider the feasibility of cutting down on water consumption, then, based on an average annual increase of 5 percent, by the year 2000 industrial water consumption will have doubled to around 100 billion cubic meters.

Civilian water consumption totals around 13 billion cubic meters a year, of which 5 billion cubic meters are consumed in towns and cities and 8 billion cubic meters in rural areas. In the future, as the population increases and standards of living improve, water consumption in urban areas will increase quickly. Assuming that by the end of the century the population of China will be 1.2 billion, of which 0.24 billion will inhabit the urban areas, then the average per capita annual consumption of water will be around 50 cubic meters of water, in all 12 billion cubic meters of water per year. With the population in the rural areas reaching around 960 million by 2000, average per capita annual water consumption will be around 12 cubic meters, a total of 11.5 billion cubic meters. In all water consumption needs in both rural and urban areas will total 23.5 billion cubic meters of water.

By the year 2000 total water needs for agricultural, industrial and civilian consumption will be in the region of 707 billion cubic meters of water, a net increase of 247 billion cubic meters, or 50 percent, over actual water consumption in recent years of around 460 billion cubic meters.

According to estimates, the total volume of usable water in China's land water resources stands at about between 1,000 and 2,000 billion cubic meters, while the maximum volume of underground water resources that can be used stands at between 100 and 200 billion cubic meters. Added together this gives us between 1,100 and 1,200 billion cubic meters of water. Thus in terms of the whole country, water resources are sufficient if we do quadruple industrial and agricultural production value by the end of the century. However, imbalances in geographical distribution have naturally created areas rich in water and other areas very poor in water resources. Water consumption will be very tight mainly in the northern regions where water resources are insufficient. In cities situated in the northwest and other northern areas, water crises are going to appear. In general, regions to the south of the Chang Jiang have surplus amounts of water but because periods of precipitation are very changeable and distribution over the year is not even, there are some dry periods and thus some areas will also experience water shortages. Thus in achieving the glorious target for quadrupling the gross national product by the end of the century we must pay a great deal of attention to the question of water resources.

Effective Policies Which Should Be Implemented

Based on objective conditions and characteristics of China's water resources, and taking into account the development of water consumption and economic requirements in China, I feel that the following few policies should be implemented in developing and exploiting water resources.

1. Active development of sources. a) We should carry out large-scale afforestation. In view of the large quantity of water lost through evaporation in China, as well as the small amount of runoff, we must pay attention to preserving existing vegetation and forbidding the destruction of forests and grasslands. The more ground vegetation that exists, the more "forest reservoirs" will increase. At the same time, we must not lose our grip on mobilizing people to plant more trees and thus conserve water in this way. "Afforestation means creating water." According to calculations, every mu of afforested land can increase water resources by 20 cubic meters and can cut down on evaporation by 30 percent. The results are very obvious.
- b) Planning work in river valleys must be well done and reservoirs of varying scales must be built in river valleys in a planned way so that water holding capacity can be expanded and as much runoff as possible may be caught.
- c) Urban areas should construct water supply plants in a planned way, thus expanding supply capacity. According to estimates, water supplies to urban areas (including water for industrial production and civilian consumption) will by the year 2000 have to increase water supply capacity to 200 million cubic meters of water per day, making an average annual increase in water supply capacity of 10 million cubic meters of water per day, equal to 50 200,000 ton large-scale water plants, and thus construction must be

entered into state planning and begun. Technological transformation and reforms should be carried out on existing water plants so that their full potential may be exploited. d) Processing plants for polluted water should be constructed in a planned way in areas poor in water resources. In this way, polluted water may be treated and then reused. This is not only the same as developing new water resources, it is also an effective way of reducing environmental pollution.

2. Work hard to cut down consumption. According to estimates, water supplies to urban areas alone will have to increase their water supply capacity by an annual 10 million cubic meters a day in the future, which will require investments of around 2 billion yuan. By the end of the century, new increases in water consumption will need around 40 billion yuan in investments, if we depend only on developing water resources to solve the problem. Investments for developing water resources in the rural areas are also enormous. Such enormous investments will be difficult for China's financial capacity to bear. Thus, at the same time as developing resources, we must work even harder at cutting down consumption. In the rural areas, traditional irrigation methods are very ineffective and uneconomical in terms of water utilization and there is thus serious water wastage. On the basis of investigations into 20 irrigation areas in the lower reaches of the Yellow River, the rate of effective utilization of water was only between 25 and 40 percent. Thus we must change these traditional methods of irrigation and introduce more scientific methods of using water, using spray irrigation and similar advanced technology as well as water conservancy measures such as seepage prevention techniques. In the urban areas water consumption quotas must be specified and planned supply should be carried out. Excesses in water consumption should be paid for with additional fees and if necessary, drastic measures such as closing valves to stop water supplies could be used. Independent water resources should also be managed and administered more efficiently. Those who misuse water supplies should be punished with economic sanctions. Cyclic water consumption should be developed and we should get to grips with reusing water. At present the rate of reused water in industrial production is very low, around 20 percent in the whole country. By implementing effective measures, raising the rate of reused water to around 70 percent or above is totally feasible. In addition, we must also reform production techniques and reduce water consumption. We must step up management overhauls of water supply and water consumption equipment and thus cut down on enormous losses through leakage. Any enterprise or piece of equipment in coastal areas which is able to use sea water as a coolant should make great efforts not to use fresh water, or to cut down on fresh water consumption.

In order to ensure that our work in cutting down on water consumption is effective, we must also adopt some economic and administrative measures to encourage both enterprises and the population to cut down on water consumption. At present, enterprises with running water make more profits the more water they sell. This kind of accounting method should be changed. Water conservation is good for the country and good for the people. According to calculations, for every 10,000 tons of water saved, we can save 2 million yuan in investments in water supply engineering projects, and

3 million yuan in investments in treatment plants for polluted and drainage water. We can also save 2.2 million watts per year of electricity to be used in the treatment of polluted and drainage water and enterprises, work units or individuals can save 1,600 yuan in water rates (calculated at 0.16 yuan per ton). We must educate the masses and the workers to glorify the concept of conserving water and to feel shame in wasting it. In this way, everyone will come to cherish water and a new socialist custom of saving water will be built up.

3. Preserve resources well. Water consumption in industrial and agricultural production not only demands a great deal of water, it also demands varying qualities of water. Water used for drinking, in food products, and in the textile industry must be of a very high quality. If the quality of the water does not come up to standard then it will inevitably affect the quality of the product and man's health. Thus in the past insufficient attention to environmental protection meant that pollution of water resources grew more serious as industrial production developed, and as the amount of waste water, waste gas and waste residue grew, and more and more chemical fertilizers and pesticides were used. According to investigations, 80 million cubic meters of waste water from industry and polluted water from living areas is produced every day in urban areas, of which more than 98 percent directly enters the existing water without being treated, leading to pollution of our rivers, lakes and underground water resources. Because a great deal of this water contains phenol, cyanogen, arsenic, mercury, chromium and other poisonous industrial wastes, water is destroyed when they flow into it as wastage, sometimes making it unusable and rendering water resources useless. In order to maintain safe supplies of water and guarantee the demands of industrial and agricultural production and human consumption in terms of water quality, we must preserve our water resources well. At present, we should primarily get to grips with handling the "three wastes" in industry, ensuring that waste water, gas, and residue come up to nationally stipulated standards. This is fundamental to ensuring good protection of our water resources. Second, we should establish water resource protection areas, forbidding the construction of polluting industries within a certain area.

4. Improve management. To a very great extent, the rational exploitation, utilization and protection of our valuable but limited water resources depends on how well management work is done. At present, management of China's water resources is rather poor and has still not got onto the right track. In strengthening management of water resources the most important thing to do is to carry out measures well suited to water conditions under examination, and to rationally deploy the productive forces. In the past some regions and towns did not thoroughly investigate the total amount of water they could utilize, due to the distribution of water resources, and thus regional and urban plans lacked any basis when they were drawn up. In other cases, the influence of "leftist" erroneous thinking meant that there was a one-sided tendency to strive for production value and quantity, ignoring the presence or lack of suitable water resources, and this sometimes gave rise to a very arbitrary deployment of the productive forces in agriculture and industry and a certain amount of blindness in planning the

direction, quality and scale of urban development, with the result that considerable economic damage was done and an enormous amount of lethargy and passivity set in the work situation. In the future, the deployment of the productive forces must not only be in accordance with local conditions and suitability, but also in accordance with water conditions. Changes in the agricultural cultivation system and the geographical allocation of crops should take into account water resources. There should not be blind expansion of paddy fields and irrigated land in areas poor in water. In industry the premise for selecting a factory site should be the ease with which sufficient water supplies may be obtained. Industries which use a great deal of water should be constructed in areas rich in water resources. In terms of individual regions and towns, plans should be drawn up to organize industrial, agricultural and domestic water consumption.

5. Scientific use of water. In this area there are many topics to be researched and much work to be done. The main things to be done are: to investigate the number and geographical locations of clean water resources and to carry out long term predictions on water consumption. We must research advanced technology in agricultural irrigation and industrial water conservation methods. We must explore new ways of tapping water resources. We must study the relationship between exploiting and using water resources and environmental protection. We must draw up plans and organize relevant technological forces together to carry out all of this research.

CSO: 5000/4183

PRIMARY TASKS FOR THE PROTECTION OF WATER RESOURCES ELABORATED

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 5, 1983 pp 2-4

[Article by Shen Ganqing [3088 0984 0615]: "A Discussion on Protecting China's Water Resources"]

[Text] The Meaning and Substance of Protecting Water Resources

What are water resources? Broadly speaking, water resources include all forms of water in the hydrosphere. But the present focus for investigation and evaluation, and development, utilization and protection refer mainly to the narrow definition of water resources, that is, the quantity of the supply of surface and ground water related directly to the planning of river basin and water conservancy projects to promote what is beneficial and eliminate what is harmful; or, it refers to the quantity of water which can provide for constant human utilization, viz., the quantity of various forms of surface water, ground water and bodies of fresh water in a dynamic state supplied by precipitation, and that is also the annual average precipitation.

What is protection? Water resources are natural resources and a key element of the environment. According to the concept of environmental protection, the rational utilization of natural resources is one aspect of environmental protection. "Protection" in the positive sense, includes preservation, the maintenance of a constant supply, and the restoration and enrichment of the natural environment.

What should the substance of the protection of water resources include? In light of China's present condition, it is generally considered to include the monitoring, the investigation and evaluation, the management, the planning, and the prediction and forecast of water quality. But viewed as a whole, these are mainly concerned with water quality. However, the protection of water resources should be considered from the two aspects of quality and quantity (for instance, the protection of the water volume includes conservation, etc.), and quality and quantity also have a dialectic relationship. We should adopt a viewpoint that includes overall systems engineering, comprehensiveness, relevance, selecting the best, and practice to organically solve the problem of water pollution and the rational development and utilization of water resources, and to integrate correctly water quality planning with river basin planning. While managing water conservancy projects, we should also develop its advantage in improving water quality, beautifying the

environment, bring the ecology into balance and do a good job of protecting water resources.

The Main Problem at Present

We should integrate our knowledge of protecting water resources. In the past, we did not pay enough attention to this point. There are many problems related to the need to integrate the knowledge of protecting water resources; here, a few problems which I consider to be more important are selected and briefly discussed.

1. Knowledge of the problem of China's water resources

According to the latest investigation and evaluation, the nation is not rich in water resources. The quantity of river and stream runoff is about 2.6 trillion cubic meters, and ground-water resources are about 700 billion cubic meters. Deducting the portion which duplicate both amounts, the total volume of water resources is about 2.7 trillion cubic meters. Add to this the uneven distribution of time and space, the ratio of the usable amount of water resources is rather small. In regard to water quality, the nation's rivers, lakes and reservoirs are, to varying degrees, polluted. Water pollution in the arid and semi-arid areas in the north is even more serious than the humid areas in the south.

After several years of work to protect water resources, the water quality in some areas has definitely improved; but for the country as a whole, water pollution in most areas has not improved but has even increased. In recent years, throughout the country, the discharge of industrial and domestic sewage has increased by the rate of 8 percent per year, exceeding the growth rate of the national economy. In many areas, the shortage of water and water pollution has seriously affected production and livelihood. Environmental and water conservancy workers should publicize and study the problem of protecting water resources, and correct the viewpoint that "our country's water resources are rich," and that water resources are inexhaustible. Also, we have to stress that the protection of water resources requires the protection of both the quality and quantity of water, including the rational use of water resources. More important, is to adopt measures from the point of view of developing the advantages of water conservancy departments, and we cannot allow the continuation of a situation in which production and livelihood are seriously affected by the indiscriminate use and transfer of water and the daily discharge of sewage exceed the growth rate of the national economy.

2. How to protect water resources

How to do a good job of protecting water resources is a major problem. In regard to developing the advantages of water conservancy departments, I believe that what is important at present is to emphasize two aspects of capital construction, emphasize planning and management to properly combine protection with the rational exploitation and utilization of water resources. The content of the plan for the protection of water resources is varied. For planning, the urgent task at present is mainly to integrate correctly traditional plans for river basins and water conservancy with contemporary plans for

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river basins and water quality, so as to manifest fully the economic as well as environmental objectives. The plan on which design, construction and operation are to be based should have a definite procedure for examination and evaluation and must be strictly adhered to. Only this kind of planning is scientific and authoritative. The substance of the management of protecting water resources is also many-sided. For management, the urgent task at present is mainly to focus on enhancing the economic results of water conservancy projects that have been built, to strengthen management, and in the control and utilization of water conservancy, to consider not only the needs of flood control, electric power, irrigation, water supply, shipping, aquatic organisms, and tourism, but also the need to protect water sources, so as to realistically emphasize both the quality and quantity of water, and to pay attention to both economic results and environmental quality. In order to concentrate on planning and management requires the strengthening of the environmental ecological viewpoint and the use of the theory, viewpoint and methods of systems engineering to compare and select the best plan. We should add the substance of environmental ecology to the traditional planning of river basin water conservancy and to the design, construction, and the operation of water conservancy projects. We should correctly handle the three-way relationship of nature, polluter and environmental protection departments in contemporary plans for river basin water quality to rationally distribute the responsibility to prevent pollution.

The key to correctly handling the three-way relationship of nature, polluter and environmental protection departments and to rationally distribute the responsibility to prevent pollution lies in the word "rational." This requires using the viewpoint and methods of overall systems engineering, comprehensiveness, relevance, the best, and practice to carrying out investigation, study and systems analysis. It also requires the adoption of measures for comprehensive control and the selection of the best plan, so that in the attainment of water quality standards in a basin or district, the least amount of investment will bring the greatest economic benefits. At the same time, the word "rational" should be dialectical, that is, we should adapt measures to time, regions and conditions.

Based on China's conditions, we should study well and resolve the question of the natural assimilation to prevent pollution, that is, the question of using the assimilative capacity of the environment rationally, including fully developing the advantages of water conservancy projects to improve water quality and the self-purification capacity of oxidation ponds and the soil. As for the large numbers of water conservancy projects that have been built, we should consider not only flood control, electric power, irrigation, shipping and water supply during operation, but also the needs of the environment and the ecology. These are measures which do not use a lot of money but can bring about economic results. We should also study well and resolve the question of the polluter (that is, the pollution source) to prevent pollution. This includes proceeding from the strengthening of management, the upgrading of technology, the implementation of comprehensive utilization and the reduction of waste to the gradual realization of closed circulation, the increase in the rate of repeated utilization of water, the implementation of a rational and fixed supply of water, imposing restrictions on or raising the price for

excessive amounts, to reduce the volume of effluent discharge. We should also demand the separation of clean and polluted water, so that they can be treated on the spot and the plant. In particular, toxic waste containing heavy metals and materials that are hard to degrade should not be discharged outside the plant. As for the ability of environmental protection departments to prevent pollution, this refers to areas having the necessary conditions to build sewage treatment plants step by step in a planned way and in accordance with the nation's or region's possibility for capital construction investment, and technical and economic level. The degree of dispersal or concentration by the sewage treatment plant, as well as the number and size of the plants to be built, should be decided after comparing many different plans and selecting the best.

In short, emphasizing planning and management enables us to concentrate on both aspects of basic construction. To develop the advantage of water conservancy departments is one important way to protect water resources.

Raise the Management Level in the Protection of Water Resources

The following is an opinion on raising the management level in protecting water resources from four different angles.

1. Make the System Sound

With regard to the management of water resources, the State Planning Commission has proposed expanding the authority of the Ministry of Water Conservancy and Power so that it will become the department for the comprehensive management of the nation's water resources, and the State Council has entrusted the Ministry of Water Conservancy and Power with full responsibility for the management of water resources. In the future, the investigation, inspection, scientific research, planning and legislative oversight work related to the exploitation, utilization, control and protection of water resources, as well as the allocation of water resources and disputes over water conservancy, will all be the ministry's responsibility. If this proposal is carried out, it will undoubtedly put an end to the past situation in which each office acted independently in the management of water resources. But the implementation of this proposal requires a lot of work. First, the system of protecting water resources itself is not sound, and the conditions of the river basic organizations vary and their division of responsibility are not uniform. As for the water conservancy departments of the provinces, cities and autonomous regions, basically, they have not geared the job of the departments or river basic organizations to that of water resource protection departments, thus seriously affecting the development of work. These problems should be studied and solved during the reform of the system. At the same time, it should be emphatically pointed out that the protection of water resources is a task which is multi-disciplinary, trans-departmental, and comprehensive in nature. We should have multi-disciplinary and trans-departmental cooperation and policy makers should select the best ideas after listening to many opinions and adopting their respective strong points.

In short, the general spirit of a sound system should be integrated management and the higher and lower levels should be geared to one another's needs. Also, such an organization should be capable, and should play at least two important roles: the first is to do a good job of organizing, coordinating and promoting the cooperation of various multi-disciplinary, trans-departmental, and specialized organizations and personnel; the second is to lead, or when the conditions are present, to independently develop general and specific policies and the exploratory and comprehensive nature of theoretical methods. This kind of organization is one with a high standard of management and is a powerful specialized organization.

2. Strengthen the Legal System

Although China's constitution and environmental protection laws have principles and regulations on the protection of the natural environment, and the prevention of pollution, including articles relating to the protection of water resources, these principles and regulations are not enough. Concrete laws, decrees, regulations, ordinances and rules must be made based on these principles and regulations before specific problems in the protection of water resources can be solved.

It should also be emphatically pointed out that strengthening rule by law is not an empty statement. From the enactment of laws to their actual implementation is a multi-disciplinary and trans-departmental activity, requiring a lot of work both before and after the act. We have to investigate, study, analyze and evaluate the laws beforehand to see if they are feasible with regard to society, the economy and technology, what impact or changes they would have on the environmental ecology, and whether they could develop in the direction of becoming beneficial to human life and existence. Before and after the laws become effective, there should begin in a planned and systematic way the necessary mass propaganda and education. After the completion of a stage, we should amend or supplement those laws on the basis of the summation of experiences and lessons after listening to the masses' opinions. In short, we should strengthen rule by law, emphasize legislative work and from every aspect guarantee the strict enforcement of the law.

3. Strengthen Scientific Research

Basically, the protection of water resources falls under the category of applied science, and since it is at the point of creating a new stage, scientific research work must be strengthened.

Although we continuously need more knowledge, what is more important at present is the use of existing knowledge, such as systems analysis and computer technology. The protection of water resources is a vast and complex system. The protection of water resources and their rational exploitation and utilization must include both quality and quantity and surface and groundwater. Since the function of water is varied and the demand for quality and quantity is constantly changing and being raised, all these add to the difficulty and complexity of the work, and systems analysis and computer technology must be fully utilized. The former greatly enhances people's analytical ability,

and the latter greatly enhances people's computation ability. The combining of these two will greatly help the planning and decisionmaking process for the protection of water resources, and thereby raise the management level in the protection of water resources. The potential contribution is tremendous. How to develop potential in the protection of water resources requires a lot of work.

In addition, what is more important is to concentrate on scientific research into the nature of the protection of water resources itself. But the outstanding question at present is the planning of scientific research and the selection of topics. Because scientific research plans are unsatisfactory, there are many problems in the selection of topics: for example, projects on the self-purifying ability of water or water quality models seldom produce complete and solid results for many reasons. Conversely, some basic topics such as the monitoring of water quality, a basic task in the protection of water resources, lack the necessary systematic and in-depth study. As regards China's modernization construction, these are principles that must be followed for a long time. In order to do well the work of scientific research planning and the selection of topics, scientific and technological information work must be strengthened.

Therefore, based on the need to integrate the knowledge on the protection of water resources, a far-sighted scientific research plan to protect water resources must be drawn up. It will not only consider the overall long-term needs but also the urgent local needs. Without the former, we cannot attract the cooperation of various forces to quickly surpass the advanced countries of the world; without the latter, we cannot find solutions to urgent problems (for example, the water shortage and the serious water pollution in areas like Huabei and Songliao) and open up a new situation.

4. Strengthen Training

After resolving the issue of understanding the importance of protecting water resources, we must pay close attention to the training and supply of the necessary specialized personnel. Specialized personnel means both the specialists and versatile persons. The former refer to specialists who can carry out independent research, planning and implement operational management on such specialized topics as the monitoring, survey and appraisal, management, planning, and prediction and forecast of water quality. The latter refer to persons with ability, no matter whether they are in water conservancy departments or related trans-departmental (the environment, ecology) trades, who possess rich theoretical knowledge and practical experience in, or a relative overall understanding of, the integration of the protection of water resources with their rational exploitation and utilization. As for both kinds of person, we should first pay attention to the rational use of existing talents: the former can be transferred from among young technical cadres, and the latter can be transferred from technical cadres with more working experience; the main thing is to raise the level through practice and integrate it with specific training, and, when needed, they can be sent abroad for further study. As for ordinary technical personnel, we can carry out

short-term training of technical secondary school students or those with an educational level equivalent to high school graduates, to increase their basic and specialized knowledge so as to meet the requirements of the work.

The protection and utilization of water resources is important in the world today, and is an important national policy in China. How to protect water resources, improve water quality, increase the water utilization rate, fully utilize water resources, prevent floods, and build large-scale water conservancy works is one of our unchanging long-term national policies. Let us who are in environmental and water conservancy work, guided by the glory of the party's 12th National Congress, contribute to the opening up of a new situation in the work of protecting water resources.

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CSO: 5000/4177

MEASURES TO CONSERVE, PROTECT WATER RESOURCES PROPOSED

Beijing RENMIN RIBAO in Chinese 19 May 83 p 5

[Article by Li Yupu [2621 7183 2528]: "The Principal Way of Solving the Near-term Contradiction between Supply and Demand of Water: Calling for Economy in Consumption of Water and Preventing Water Pollution"]

[Text] In order to realize the strategic goal of quadrupling the nation's total industrial and agricultural output by the year 2000, should the main effort in water conservancy be to build new projects to increase the capability of water supply or should it be to develop potential and renovate, conserve and protect water, and use water scientifically? This is an important question that cannot be shunned in the strategic plan to initiate new prospects for water conservancy facilities.

The nation's total volume of water resources averaged over many years is about 2,700 billion cubic meters, a per capita average of less than 2,700 cubic meters. Of the total volume of water resources mentioned above, a fairly large part cannot be used because of the great differences in distribution between regions and between years and under present technical and economic conditions. According to preliminary analysis and estimates, only about 1,200 billion cubic meters of the total volume of water resources can be used. By the year 2000, when the nation's population surpasses 1.2 billion, the per capita amount of water that can be used will be less than 1,000 cubic meters. This is a very severe problem in future national economic development. It should also be pointed out that the volume of water that can be used does not equal the volume of water that can be supplied. To change the former to the latter, we still need to build a series of projects to transfer, regulate and distribute water resources. During the more than 30 years since the founding of the nation, we have formed a water supply capability of about 470 billion cubic meters by building various types of water conservancy projects and facilities. According to estimates, building an average of 1 cubic meter of water supply capability requires about 0.2 yuan in investment, 0.12 yuan of which is state investment. Foreign and domestic experience in the development and utilization of water resources shows that the goal of development during the early period was generally easy. As time passed, conditions became more demanding, engineering technology became more complex, the investment in the unit water supply capability also increased. Most comrades predict that by the year 2000, the total volume of water needed by China each year will increase from the current 462 billion cubic meters to

626 to 732 cubic meters. The needed investment for construction will be about 50 to 80 billion yuan, accounting for 29 to 47 percent of the total investment in national capital construction during the "Sixth Five-Year Plan" period. Therefore, relying on building new water conservancy projects to solve the ever increasing demands for water supply is difficult for the nation's economic capability to bear.

In China, the conflict between supply and demand of water resources is very severe, and there is serious waste in the current water supply system, but the potential for conserving water is great.

Agriculture consumes a large part of the total volume of water used in our nation. Of the total of 470 billion cubic meters of water used in China each year, agriculture consumes 419 billion cubic meters, accounting for 88 percent. But agriculture is also the sector that wastes the most water. Of the 700 million mu of irrigated area, irrigation is guaranteed only for more than 500 million mu, and only 300 million mu can truly produce a guaranteed harvest in drought and waterlogged conditions. In the nation's more advanced irrigated regions, the coefficient of effective utilization of the irrigation canal system is over 0.6, the rate of effective utilization of water is 55 percent, but the coefficient of effective utilization of most canal systems in the irrigated regions is less than 0.4, and the rate of effective utilization of water is less than 35 percent. Like the development of potential and renovation of industrial production facilities and technical improvement, the development of potential, renovation and improvement of existing water supply facilities also require definite investment, but the benefits from investment are far greater than those from building new projects. In the irrigated region of the Jinghui Canal in Shaanxi Province, one-third of the main canals, the branch canals and the small canals were lined with masonry year after year. This increased the coefficient of effective utilization of the canal system to 7 percent, and the loss of water in transport each year could be reduced by 30 million cubic meters, equivalent to adding an irrigated area of over 80,000 mu. Building a new irrigated area of 80,000 mu requires an investment of at least 5 million yuan; the cost of lining the canals with masonry was less than 1 million. Nationally speaking, if the rate of utilization of irrigation water can commonly reach the general advanced level in the nation, then more than 100 million cubic meters in water supply capability can be added. Of course, the rate of utilization of some water resources is already high, and in regions with severe water shortage, new sources of water must be opened up, but the scale must not be too large.

The nation's urban industries use more than 57 billion cubic meters of water, accounting for 12 percent of the total volume of water used throughout the nation. It is expected that by the year 2000, the water supply capability will have to be increased by 63 to 90 billion cubic meters to meet the need for water used by urban industries. Because the requirements of guaranteed water supply and the quality requirements of water used by urban industries are much higher than those of the water supply for agriculture, the investment in unit water supply capability is also much greater than that of agricultural water supply. Although the potential volume of water supply for urban industries to be developed is far less in absolute quantity than for agricultural water supply, the economic value is sizable. Like water used for agriculture, the water

used by urban industries is also being seriously wasted. Compared to developed nations, the consumption of water per unit product in China is much higher than that in foreign nations. At present, the volume of water used for every 10,000 yuan in output value is 573 cubic meters, more than two times the volume of water used in Japan in 1970. The rate of repeated utilization of industrial water in our nation is only about 10 percent, one-fifth that in Japan.

The nation's water resources are valuable, but pollution and destruction of water sources have become more serious. According to incomplete statistics, the amount of polluted water discharged each day throughout the nation amounts to more than 720 million tons. In general, industrial sewage accounts for 81 percent, domestic sewage accounts for 19 percent, and basically the sewage is released into rivers without any kind of treatment. The pollution and destruction of water resources will sharpen the conflict between supply and demand of water for use in agriculture and industry, and if this continues for a long time, there will be serious consequences.

To sum up, the main countermeasures to protect water resources in the near-term should be to greatly conserve the use of water, prevent the pollution and destruction of water resources, and pay special attention to the problem of how to conserve the use of water in industry, agriculture and society as a long-term plan. For this, it is suggested that the following measures be taken:

First, we must use various means of propaganda, and devote major efforts to publicize the conservation of water resources and the important significance of firmly protecting water resources from pollution and destruction in developing a new situation in socialist construction. Schools must educate children to conserve water, to cherish and treasure water from elementary school on so that everyone will understand that treasuring and protecting water are a virtue, and that wasting, destroying and polluting water sources are shameful deeds.

Second, we must use the main investment in water conservancy to "develop potential, renovate and improve" existing water conservancy facilities, completely revise investment policies of past capital construction projects for which there are materials and funds and not list projects for which there are neither materials nor funds.

Third, we must rationally determine the price of water, change the present excessive low price for water which encourages "the use of water from the same big pot". We must allow those who conserve water to receive more benefits and make those who waste water suffer economic loss.

Fourth, we must quickly establish a national water law and proper legal sanctions against those who destroy and pollute water resources so that water conservancy projects and facilities and water resources can be concretely protected by law.

Fifth, we should greatly strengthen water and soil conservation, hasten the treatment of regions suffering from soil erosion, and regard the protection of the ecological environment of river sources as a major task to benefit future generations.

9296

CSO: 5000/4166

PLANS TO STUDY WATER PROBLEMS IN NORTH REPORTED

OW261145 Beijing XINHUA in English 0820 GMT 26 Aug 83

[Text] Beijing, August 26 (XINHUA) -- China will work out plans by the end of 1985 to alleviate water shortages in north China on the basis of scientific investigation and evaluation, according to the State Science and Technology Commission.

Studies will focus on accurate assessments of water reserves in the area, surveying their sources and distribution, and predicting demand from major water users, including coal enterprises in Shanxi Province, the municipalities of Beijing and Tianjin, and rural agricultural units.

Programs will be worked to exploit underground water and store and distribute surface reserves. Efforts will also be made to solve problems in treating and utilizing urban supplies and underground salt water resources.

North China, one of the nation's major economic bases, averages only 14 percent as much water per hectare as the country as a whole. Its water resources have been severely strained by rapid agricultural and industrial development, particularly in coal-mining areas of Shanxi Province. Underground reserves have been dropping, and some sources are polluted.

The campaign to solve the water shortage problem will play an important part in promoting China's national economic and social development, the Science and Technology Commission said.

CSO: 4010/93

JILIN EXPERIENCES WATER SHORTAGE

SK290535 Changchun Jilin Provincial Service in Mandarin 2200 GMT 28 Jun 83

[Text] According to CHANGCHUN RIBAO, the provincial and Changchun City People's Governments have decided to divert 1 million cubic meters of water from the (Shimen) reservoir in Yitong County to ease the water shortage of Changchun City. On 28 June, the (Shimen) reservoir began to release water to the (Xinyicheng) reservoir in Changchun City. As of 27 June, the (Xinyicheng) reservoir only had 3.8 million cubic meters of water. Except for a storage capacity of 3 million cubic meters of water, the reservoir only had 4-day water supply left for Changchun City. Though the (Shitoukoumen) reservoir, another city water source, can currently keep on supplying water, its daily water supply only reaches 100,000 tons, only accounting for half of the city's daily consumption.

According to forecasts of the meteorological department, in early July Changchun City will not receive heavy rainfall. Therefore, the majority of industrial enterprises and a number of residential areas throughout the city will suffer from a serious water shortage in July. To solve this problem, the provincial and city People's Governments plan to divert 10 million cubic meters of water from the (Xinxingshao) reservoir in Yongji County. The water diversion is expected to be carried out in mid-July. Meanwhile, they plan to tap the water supply at the (Xinyicheng) reservoir and to curtail the city's water consumption as much as possible to extend the water supply capacity.

The city People's Government called on units and people throughout the city to launch water conservation activities. Enterprises engaging in commodity and power production must block all water leaks and devise measures for re-using water. The people across the city should also save tap water and resolutely refrain from using tap water to irrigate vegetable farms. It is necessary to encourage the people to re-use water and to make concerted efforts to overcome the water shortage.

CSO: 4008/224

ENVIRONMENTAL MANAGEMENT OF THE GUANTING RESERVOIR DISCUSSED

Beijing HUANJING KEXUE [JOURNAL OF ENVIRONMENTAL SCIENCE] in Chinese No 1,
Feb 83 pp 56-58

[Article by Liu Yansheng [0491 3601 3932] of the Leadership Group, Guanting Water System and Resources Protection Office: "Management and Scientific Research on the Protection of Water Sources and Systems of the Guanting Reservoir"]

[Text] I. Characteristics of the Scientific Research Work on Protection of the Water Sources and Water Systems of the Guanting Reservoir

A. Research Topics Arranged on the Basis of the Actual Needs of Water Source Protection

The scientific research on protecting the water system and water sources is based on the need of protecting the water sources; therefore, almost all the topics are closely combined with the actual work of protecting the water sources. For example, research on the overall evaluation of water pollution, evaluation of the environmental quality of the river valley, planning and managing the water quality, etc., serve the need of formulating a comprehensive treatment plan to protect water sources or water quality management. Research on the technology to treat pollution sources is being carried out in plants selected for treatment. After the studies are completed, they will be directly applied to wastewater treatment in these plants. This type of scientific research is based on the needs of the actual work of protecting the water sources; the results can be easily popularized and applied to prevent scientific research and actual production from becoming isolated from each other. Because scientific research is combined with the actual work of protecting the water sources, the direction of research is clear and the purpose is strong, stimulating the researchers' interest and promoting the progress of the scientific research.

B. Cooperation Among Many Disciplines and Many Departments Is the Basic Form of Research Work on Protecting Water Sources

The work of protecting the water sources involves many disciplines and many departments. It is highly comprehensive and covers many areas. Therefore, the work can be brought to a successful completion only through the cooperation

of many disciplines and departments. Especially during the first few years of the program, environmental protection specialists and agencies were yet to be perfected. There was no capability to take on large scientific research projects and the program depended upon the cooperation of many disciplines and departments to complete the scientific research tasks. More than 40 units, including the Chinese Academy of Sciences, the Chinese Academy of Medical Sciences, related research institutes of the Chinese Academy of Forestry and Agricultural Sciences, environmental protection, water conservancy, public health and epidemic prevention, industrial departments, and institutions of higher education, participated in the research. During the research work, each unit and each department gave full play to the professional skill, at the same time, they advocated learning from one another, working in coordination and completing the research tasks together.

As the local environmental protection agencies were being established, the contingent of environmental protection specialists grew and became strong. Some minor topics were handed over to the local specialty teams but the scientific research departments were still needed for guidance and assistance regarding research methods and specific techniques. Moreover, because the local environmental department was familiar with the condition of the water sources in the area and could suggest convenient ways (such as transportation, orientation, etc.) in the research process, therefore, depending on the cooperation among many disciplines and departments to complete the research also depended on the close cooperation of local environmental protection departments.

The cooperation among many disciplines and departments and the joint efforts of environmental protection specialists to complete the research tasks can also improve the level of scientific research of environmental protection specialists, train and strengthen specialists and technicians for water source protection, and promote the increase of environmental protection specialists.

C. Efforts To Organize and Manage Scientific Research Work in Depth and in Precise Detail

During the cooperative research on protecting the water systems and water sources of the Guanting Reservoir, a special subject unit was responsible for organizing a key group in charge of harmonizing and coordinating various technical problems. The technicians and managers of the leading group to protect the water system and water sources of the Guanting Reservoir are in charge of the liaison work among the cooperative groups and cooperative key groups and are responsible for the organization and management of daily affairs. The managers had to familiarize themselves with all the special topics in order to grasp many conditions, discover problems in time, solve the problems and promote the smooth development of the scientific research work. The management department regularly compiled and issued brief research bulletins to reinforce communication among the various scientific research cooperative units.

II. Major Contents of the Scientific Research on Protecting the Water System and Water Sources of the Guanting Reservoir

For 10 years, the major topics have been: (See Table 1)

Table 1. Scientific Research Topics on Protecting the Water Sources of the Guanting Reservoir

Special Topics	Major Contents
Overall evaluation of water pollution and environmental quality of the river valley	<ol style="list-style-type: none"> 1. investigation and evaluation of pollution sources 2. research on water pollution of the reservoir and the rivers entering the reservoir 3. study on the self-purification capacity of the water and mud pollution 4. research on the impact of water pollution on soils, crops and aquatic organisms 5. experimental research on the effects of reservoir water and fish on mink 6. investigations and observations of the effect of reservoir pollution on the health of the inhabitants surrounding the reservoir 7. study on the effect of reservoir pollution on the groundwater of the lower reaches 8. experimental research on effluent irrigation 9. evaluation of the environmental quality of the Yang He Valley 10. evaluation of the environmental quality of the Sangan He Valley
Water Quality Plan	research on the water quality management plan of the Xuanhua Section of the Yang He
Evaluation of the effects of mining	study on the impact of mining a certain phosphate deposit on the surrounding environment
Research on treatment techniques for pollution sources	<ol style="list-style-type: none"> 1. study on handling effluent from DDT production 2. experimental biochemical treatment of effluent from chloroprene rubber 3. experimental treatment of chloroprene wastewater with activated coal 4. study on the sand filtering method to treat carbon black effluent 5. study on the comprehensive utilization of cyanogen-containing effluent from the coking process 6. experiment on biochemical recovery of phenol-containing effluent from the coking process 7. experiment on recovery and utilization of chromate from fur effluent 8. experiment on soda recovery techniques from black liquor in paper-making 9. experiment on producing phosphate fertilizer from black liquor in paper-making 10. experiment on activated coal adhesion treatment of mercury-containing effluent
Research on methods for monitoring and inspection	<ol style="list-style-type: none"> 1. studies on methods of chemical analysis for trace quantities of nitro benzene, DDT, BHC, chlorobenzene compounds, lead, cadmium, molybdenum, beryllium, chloroprene, etc. 2. study on fast test methods for water quality

With respect to the overall evaluation of water pollution (including investigation on pollution sources) the two methods of index evaluation of pollution sources of equivalent pollution load and pollution load ratio were proposed. The merits of adopting the two indices for evaluation of water polluted by many elements include simplicity and overall comparison. Judging from analysis and evaluation of different sources of pollutants, including factories, areas, and streams, wastewater discharge is found to be the most serious source of pollution of the Yang He. Pollutants in such cities as Xuanhua, Shacheng, etc., are concentrated. There are 29 key polluting plants and the toxic substances discharged amount to more than 98 percent of the total pollutants discharged in the entire river valley. Through investigation of the condition of water pollution, it was determined that the main pollutants which cause water pollution of the Guanting Reservoir are phenol, cyanogen, arsenic, chromium and mercury. Through studies on soil, crops, and aquatic organisms, it is believed that the mild pollution of the reservoir water had no noticeable effects on the quality of soils and crops. Studies on fish showed that before and after 1972, when pollution of the reservoir water was most severe, the growth of fish did slow down for some time, but the regional system of aquatic organisms was not destroyed. Investigation and observations on the health of persons in areas surrounding the reservoir did not disclose any direct effects from drinking reservoir water or eating reservoir fish on their health.

Some basic questions on the pollution of the Guanting Reservoir were answered through this type of research, and provided a scientific bases for water protection work and advanced the basic method for an initial evaluation of the water quality of fresh-water bodies. On the basis of water quality evaluation, the environmental quality evaluation of the Yang He and Sanggan He River Valleys was also carried out. After the evaluation, tentative ideas for the regionalized management of the river valley environment, were raised and provided important reference value for directing the work of water source management.

Research teams were organized to conduct research on the overall treatment techniques and plans for major sources of pollution according to the needs of controlling and treating the sources of pollution of the water system. Some experimental studies on wastewater that is difficult to treat were conducted by specially organized attack teams; some major problems were solved and good results were obtained for actual production applications.

Quantitative determination of some chemicals were required in some studies mentioned above, but because the technology could not satisfy the needs of the research work, the analysis method of some substances had to be studied first. At the same time, some hasty inspection methods were studied and mass surveillance activities launched to meet the needs of the work of managing the protection of water sources.

Moreover, as the work continued, research on the water quality management of the Xuanhua Section of the Yang He and research on the impact of phosphate mining on water quality and the surrounding environment were launched in the past 2 years to investigate scientific management methods.

III. Problems of Managing and Protecting the Water Sources of the Guanting Reservoir

The basic task and objective of protecting the water sources are to control and reduce pollution and to maintain and improve the degree of purity of the water; therefore, management work to protect the water sources must be strengthened. Judging from a decade's practice in protecting the Guanting water system, there are two major aspects in managing water protection: managing the pollution sources and managing the water quality of the reservoir. Managing the pollution sources is mainly to control the sources of pollutants and reduce the discharge of pollutants; therefore, plants and mines that discharge a large amount of effluent should be treated first. From 1972 to 1976, 77 control projects for 39 plants were the key projects. After these pollution sources were controlled, one-third of the total amount of industrial discharge was taken care of, and more than one-half of the total amount of harmful substances discharged were reduced. Ordinary plants or key plants and mines that failed to meet the effluent standards set by the state were charged effluent fees. Facts have proven that charging effluent fees is an effective management measure to encourage industrial and mining enterprises to treat wastewater and strictly limit discharge. According to state regulations, all newly enlarged or constructed large-scale engineering projects (such as water conservancy projects) must submit an environmental impact statement and must implement the "three-simultaneous" efforts management system strictly.

We definitely believe that the management of pollution sources is a preliminary stage to manage water source protection, because this type of management merely controls the discharge of wastewater at the pollution source and does not take into consideration natural assimilation. There is also no way to calculate the degree of water quality improvement. The amount of manpower, materials, and money used does not necessarily improve the water quality directly. With the development of water protection science and raising the management level of water protection, we need to raise the water quality standards based on existing water quality levels; intentionally limiting the discharge of pollutants is a water quality management plan. The foundation of a water quality management plan is to make a natural purification model (or a model of the pollutant load principle). In addition, there are problems setting goals, analyzing the economic benefits of distribution and reduction of pollutant indices, and carrying out a comparison of various plans.

During the work to manage the water sources and water systems of the Guanting Reservoir, the Xuanhua Section of the Yang He was chosen to formulate the water quality management plan on oxygen consumption, and it is now being implemented.

IV. Prospects for the Scientific Research and Management on Protecting the Water Sources of the Guanting Reservoir

The work of protecting the water sources has a long way to go to reach a modern standard. If the water quality is to be further improved to an even cleaner level, beside implementing a water quality management plan for the

entire water system to improve the purity of the water continuously and to control new and old pollution sources, we must also strive forward towards managing the environmental quality of the entire river valley. If the environmental quality of the river valley deteriorates it will not be possible to protect the purity of the water only. While improving the environmental quality management of the valley, protecting the ecological environment of the valley is very important. The Guanting River Valley is located in a transitional section between the Nei Monggol Plateau and the North China Plain. It is an area of mountains and hills. Because the climate is semiarid and vegetation has been destroyed, soil erosion has become serious, causing high level of silt in the river. Soil erosion often carries pollutants (especially pesticides) in the soils of the upper reaches into the river channels and the reservoir. Therefore, protecting the ecological environment of the upper reaches is also extremely important in protecting water sources.

Yanbei Prefecture, Shanxi Province in the upper reaches of the Guanting River Valley is an important coal-producing region. In order to fully develop its superior conditions of abundant resources and convenient transportation, the comprehensive planning work for the entire valley must be well taken care of so that the natural resources within the valley may be fully and reasonably used, moreover, on the basis of evaluating the environmental quality of the entire river valley, countermeasures must be proposed to protect the natural resources and environment, and to promote economic development.

With the continuous development of the work to protect water sources, modern technology and equipment should be used as soon as possible, for example, an automatic monitoring system should be set up and systems engineering should be applied.

In a word, the use of modern science and technology to reinforce water source protection management work is the necessary direction for the future development of water source protection.

6248

CSO: 5000/4155

MEASURES TO PROTECT ECOLOGICAL ENVIRONMENT OF THE TUO JIANG SUGGESTED

Chengdu SICHUAN RIBAO in Chinese 7 Feb 83 p 2

[Article by Che Rongchang [6508 2837 2490] and Meng Jining [1322 1015 1380]:
"Adopt Measures To Protect the Ecological Environment of the Tuo Jiang"]

[Text] The Tuo Jiang which flows across the heartland of Sichuan, covers 28,000 square kilometers of area, and flows through eight cities and 33 counties (cities) and 17.9 million mu of irrigated area. It is a major producing area of grain, oil, cotton and sugar cane. The Tuo Jiang has many tributaries, a narrow width of surface area, a steep gradient, and is abundant in hydroelectric resources. For many years, because a lot of forests have been cut down, the proportion of plant cover has decreased sharply (only 2.2 percent in the Neijiang area in the middle reaches; about 3 to 6 percent in Fushun, and Lao County in the lower reaches). As a result, the amount of water in the Tuo Jiang diminishes every year, soil erosion is serious, channels are silted and frequent disasters such as drought, waterlogging, flood and hail occur. Recently, many electric power projects for irrigation and diversion projects have been constructed along the river banks. Industrial water consumption and domestic water consumption in cities also increase annually. Some sections of the river and its tributaries have shown signs of drying up.

On the other hand, because most cities in the Tuo Jiang Valley are located along the railroad line with convenient land and water transportation, development of major industries such as paper mills, sugar refineries, chemical fertilizer, sulphuric acid, coking, wineries, printing and dyeing, and machinery has been fast. Throughout the year, nearly 400 million tons of industrial waste water, and a large amount of domestic sewage, enter the Tuo Jiang, causing serious water pollution. Water in some river sections and some tributaries is black and smelly. The situations mentioned above, not only affect the development of industrial, agricultural and fishery production, but also harm, to varying degrees, the people's life and health. Harness the Tuo Jiang, improve the ecological environment and eliminate pollution, this is a problem worth consideration.

The provincial party committee and provincial people's government have always paid close attention to controlling pollution of the Tuo Jiang, and have issued many directives. In 1981, they set up the Tuo Jiang Valley Environmental Protection Leading Group and focused on controlling the industrial "three wastes" in the Fuxi River Valley and the Qingbai Jiang area in Chengdu. The water quality in some sections of the river has improved and pollution in some areas has decreased. But judging present conditions, great effort is still needed to thoroughly carry out work in the following areas. First, we must strengthen the leadership of the Tuo Jiang Valley environmental work. The Tuo Jiang Valley Environmental Protection Leading Group must earnestly shoulder the responsibility for leadership, organization, coordination, unified administration, supervision, inspection and the comprehensive control of the Tuo Jiang, and should establish regulations concerning the protection of the Tuo Jiang, scientifically establish long- and short-term plans for harnessing the Tuo Jiang, and carry them out step by step in a planned way. Second, in order to protect the ecological environment of the Tuo Jiang Valley, we should begin an in-depth, comprehensive investigation of the evolutionary changes, present condition and developing trend of the Tuo Jiang Valley's environmental resources, analyze and study the major environmental factors affecting the ecological balance, and propose the best plans for overall control of the Tuo Jiang. According to the principle of suiting measures to local conditions, we should adopt both biological and engineering measures, create more forests and trees, increase the area of vegetation, strictly carry out forest regulations and protect existing forests to control soil erosion and decrease the amount of sediment entering the river. We should also fully utilize the water during flooding periods, develop gravity irrigation, and strictly forbid farming near the river. It would be best to construct reservoirs along the tributaries and mainstreams of the Tuo Jiang so that flood water can be stored and used at other times. Third, we should carry out scientific projects to determine the assimilative capacity and the migration and transformation of pollutants in the Tuo Jiang's different sections and provide a scientific basis for establishing water quality plans, standards, laws and other related policies and thereby control the total amount of pollutants entering the Tuo Jiang. Maximize the use of the water's assimilative capacity so that the result of treating the Tuo Jiang will be little investment and great benefits. Fourth, prevent the increase of new pollution sources in the Tuo Jiang Valley. All enterprises in the river valley that are planning new construction projects, large and small-scale, should simultaneously set up environmental protection facilities. Enterprises that seriously pollute and cannot be easily treated should no longer be constructed along the banks of the river, especially in the Qingbai Jiang area and the upper reaches of the Fuxi He. Fifth, integrate technological transformation with the readjustment of industries to control key pollution sources. Enterprises that seriously pollute the Tuo Jiang, such as sugar refineries, wineries, paper mills, slaughterhouses, printing and dyeing factories, should adopt effective measures to reduce the discharge

of pollutants. Enterprises such as chemical fertilizers, sulphuric acid and coking should eliminate the "three wastes" in the production process by strengthening management and improving technology. Enterprises that seriously pollute should be controlled within a definite time. Enterprises that seriously pollute and can not be easily treated, in relationship to the readjustment of industries, should be closed, suspended, merged or retooled. Units that obtain prominent achievements in comprehensive utilization, conservation of natural and energy resources and treatment of the "three wastes" should be encouraged and rewarded.

12365

CSO: 5000/4149

RESEARCH ON PREVENTING WATER POLLUTION IN TAI HU AREA APPRAISED

Beijing GUANGMING RIBAO in Chinese 7 Mar 83 p 2

[Article by Lu Yang [7120 2543]]

[Text] "Research on the Comprehensive Prevention and Control of Water Pollution in Major Cities of the Tai Hu area in Southern Jiangsu," one of the key scientific and technological projects in the state's Sixth 5-Year Plan, was appraised in Changzhou, Suzhou and Wuxi recently. Specialists coming from all over the country earnestly appraised the project regarding its strategic goal, design, technological adaptations, and the conditions to guarantee the completion of the tasks.

The Tai Hu area in southern Jiangsu has superior natural conditions and a highly developed culture. The rate of economic development is among the fastest in the nation. However, some of its waters and streams are polluted, and the ecological environment is being destroyed, greatly affecting the lives of the people and the development of the national economy. During modernization construction, this is a problem requiring an appropriate solution.

After appraising the topics: "A Study on the Plan for Comprehensive Prevention and Control of Water Pollution in Suzhou City and Wu County and the Scenic and Tourist Value of Parks and Forests," "A Study on the Evaluation of the Current Condition of the Environment in Wuxi City and Comprehensive Prevention and Control Techniques," "A Study on the Estimate of the Impact of Economic Development in Changzhou City (Wujin County) on the Environment Countermeasures To Protect the Environment," and "A Study on the Estimate of Water Pollution by the County, and Commune and Brigade Industries and Agriculture in the Tai Hu Area in Southern Jiangsu and Its Control," countermeasures were proposed to control environmental and ecological changes, to improve the quality of the environment and to grasp the key link of the area's environmental and ecological issues in keeping with the strategic goals of economic development defined by the 12th Party Congress. These studies emphasize the feasibility of applied technologies and environmental engineering and provide economically effective technical plans for comprehensive prevention and control. With respect to the rational utilization of resources and energy, the unity of environmental benefits, economic benefits, and social benefits should be implemented. This has strategic significance for promoting sustained economic growth. This appraisal conference was sponsored and convened by the Jiangsu Provincial Science Committee and Provincial Bureau of Environmental Protection.

MASSSES COMPLAIN ABOUT POLLUTION OF RIVER WATER

Fuzhou FUJIAN RIBAO in Chinese 17 May 83 p 2

[Article: "Pollution of the Longjin River"]

[Text] Comrade Editor:

The Longyan City paper mill is located in Longmen along the upper reaches of the Longjin River. For many years, especially in recent years after it expanded its production scale, large volumes of effluent are discharged into the river, seriously polluting the water and affecting industrial and agricultural production and the health of the people of Longyan City at the lower reaches of the river. We have written hundreds of letters and made numerous proposals at the municipal people's congress, demanding prompt handling of the problem. Yet the departments concerned have ignored it completely. After the promulgation of the "Environmental Protection Law of the PRC," the Longyan prefectural environmental protection leading group made a decision according to law and ordered the paper mill to achieve "discharge of black liquid treated up to state standard" in 1982. Yet to date, the responsible persons of the mill have taken no steps to solve the problem. Article 32 of the "Environmental Protection Law" provides: In regard to the leading personnel of units seriously polluting and destroying the environment, "their administrative and economic responsibilities must be investigated, and their criminal responsibilities must be investigated according to law." We demand that the personnel concerned be handled according to this provision and that the river water pollution issue be promptly solved.

Some residents of Longyan City.

Together with the Longyan prefectural and Longyan City environmental protection offices, we, after investigation, have found that the conditions reported in your letter are basically true.

The Longyan City paper mill was built in 1952. At that time, consideration was not given to the issue of environmental protection. The mill is

located on the slope of Longmen hill. With the expansion of the production scale, the volume of effluent discharge containing massive harmful substances has also increased. The mill consumes 1.465 million ton of water annually, discharging 980,000 tons of waste water and 22,500 tons of black liquid. By monitoring, the Longyan prefectural environmental protection office has found that the content of harmful substances in the effluent discharge of the mill exceeds state standards and that the Longjin River is polluted.

Highly dissatisfied, the masses have time and again appealed to the departments concerned for a prompt solution. The provincial and prefectural party committee leaders have issued instructions many times for prompt handling. The prefectural and municipal environmental protection organs have intensively investigated and checked the situation and proposed feasible measures, asking the mill to solve the issue of black liquid discharge in 1982. The provincial and prefectural light industrial departments allocated more than 1 million yuan to build a less pollutive small workshop for tobacco paper to replace the glazed paper workshop. After the tobacco paper workshop was put into operation last year, the mill has continued using the glazed paper workshop. To prevent the masses from seeing the contaminated water in daylight, the mill has resorted to the method of blocking the black liquid in daytime and discharging it at night, and the problem remains unsolved.

It is hoped that the mill will promptly and earnestly solve the problem.

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6080
CSO: 5000/4173

MEASURES URGED TO PREVENT DESTRUCTION OF AQUATIC RESOURCES

Water Polluters Fined

Hangzhou ZHEJIANG RIBAO in Chinese 14 May 83 p 1

[Article by He Jiaguang [6320 0163 1684]: "A Thousand Mu of Water Is Polluted, Many Fish and Shrimp Are Poisoned--Concerned Departments of Shaoxing City Mete Out Severe Punishment to Gao Yongkang and Three Other Persons for Sabotaging Aquatic Resources"]

[Text] Concerned departments of Shaoxing City imposed a 3,600-yuan fine on Gao Yongkang, Chen Rongfu [7115 2837 1381], Dai Haixing [2071 3189 5281] and Chen Jiafu [7115 0502 1381] as punishment for using a highly toxic pesticide to pollute water and destroy aquatic resources. Their fishing gear was also confiscated according to law.

Gao Yongkang and the others are members of the Chengdong Commune, Shaoxing City. From November of last year to January of this year, they used 9.2 shijin of a highly toxic pesticide to catch fish and shrimp in Yuhang, Jiaxing, Zhuji and Xiaoshan counties and cities and in waters under the jurisdiction of Shaoxing City, resulting in serious pollution of more than 1,400 mu of water and the death of large numbers of fish, shrimp and clams and impairing the health of neighboring residents. Following these incidents, Shaoxing City's aquatic bureau, city environmental protection office and relevant districts and communes, on the basis of joint investigations, meted out severe punishment to the four persons in accordance with relevant laws and decrees of the State Council and the provincial people's government. The Shaoxing City People's Government also issued a circular to this effect, urging all districts, towns, communes and neighborhood committees to conduct education among the broad masses of cadres and masses to resolutely stop similar violations of law from occurring.

Legal Measures Encouraged

Hangzhou ZHEJIANG RIBAO in Chinese 14 May 83 p 1

[Commentary: "Resolutely Stop the Destruction of Aquatic Resources"]

[Text] Poisoning fish, dynamiting fish, stealing fish and shrimp from state and collective fisheries and destroying the property of fisheries--such cases have recently occurred in many places. This has not only endangered fish and

destroyed aquatic resources, but also has seriously polluted water and affected the people's health. Such violations of law naturally evoke strong protests from the masses. They demand that concerned departments adopt effective measures to stop such violations to guarantee the normal operation of fishery production.

Now, most people know that indiscriminately felling trees and stealing crops are against the law and shameful. But those who steal fish and shrimp, and destroy aquatic resources are not severely punished. This is wrong. In fact, relevant laws and decrees of the state stipulate in explicit terms that we should protect and properly use aquatic resources and strictly forbid catching fish by using dynamite, poison and electricity or through behavior which seriously harms aquatic resources.

The people are gratified that the Shaoxing City aquatic bureau and environmental protection office have severely punished, according to law, criminals who used highly toxic pesticides to pollute water and destroy aquatic resources. All localities with aquatic resources should conduct propaganda and education, establish rules and regulations for villages and people, strengthen fishery management and conscientiously protect and rationally utilize aquatic resources to accelerate the development of fishery production.

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CSO: 5000/4169

PRIORITY TO DEVELOPING FORESTRY RESOURCES STRESSED

HK080332 Beijing RENMIN RIBAO in Chinese 5 Sep 83 p 2

[Commentator's article: "Vigorously Plant Fast Growing, Enormously Productive Trees"]

[Text] In recent years, with the changes in the rural economy and the popularization of science and technology, large areas of fast growing and enormously productive forests have been developed in our country. From the east coast to the northwest plateau, from the regions of rivers and lakes in southern China to the open country in northern China, stretches of fast growing and enormously productive forests have appeared one after another. Experience gained by some areas has shown that planting large areas of fast growing and enormously productive forests not only can increase forest resources and help solve the shortage of timber, but can also help increase peasants' incomes and promote the prosperity of the rural economy. So it is a significant affair.

Forest resources in our country were insufficient in the past, and their distribution was uneven. For a long time in the past, timber was always in short supply. Planting fast growing and enormously productive forests can shorten the lumbering period by a big margin and allow more trees to grow in a unit area so as to greatly increase timber output. The department concerned has forecast that if 60-70 million mu of fast growing and highly productive forests can be planted within the next 20 years throughout the country, then the annual timber output by the end of this century will reach 40 million cubic meters.

Fast growing and highly productive forests can achieve quick returns, rapidly increase accumulation, and they do not need much investment. The masses describe these forests as "green banks" from which they can earn good returns on small amounts of investment. Therefore, it is a reliable way to make peasants rich, and we must pay special attention to it. These forests can also maintain the ecological balance, because they help conserve water and soil, resist erosion by wind, fix dunes, and regulate temperature. The enormous quantities of twigs and leaves can be used as fodder, fertilizer, and fuel. Planting fast growing and highly productive forests is so beneficial, why not go ahead with it?

In our country there are many varieties of fast growing trees, and natural conditions are good for planting these trees. With the high enthusiasm of the masses for planting trees, the prospect of developing fast growing forests is bright. Some comrades fear that forests will use farmland and affect the production of other crops. This worry is unnecessary. In our rural areas there are still large areas of uncultivated land on river and lake beaches and on mountain slopes, which can be used to develop forestry.

In farming areas on plains, fast growing trees can be grown as cash crops. Reasonable interplanting of trees and other crops will not affect agricultural production, but will improve ecological environment and promote the development of agriculture and animal husbandry.

Planting fast growing and highly productive forests must rely on science. We must change the previous extensive cultivation method which did not give consideration to the selection of suitable tree varieties and land into intensive cultivation by adopting advanced cultivation techniques. Only thus can we achieve our expected results. Planting fast growing trees is a priority technical project for developing forestry during the Sixth 5-Year Plan. When planting fast growing forests, local departments concerned should make great efforts to spread and publicize advanced cultivation techniques and ensure high cultivation quality. At the same time, it is necessary to adopt various production responsibility systems and formulate correct policies so as to arouse the enthusiasm of the masses for planting trees. With correct policies and advanced technology, we will certainly succeed in planting more fast growing trees and will achieve quick results.

CSO: 4008/220

RENMIN RIBAO ON COMBATING SAND EROSION

HK291021 Beijing RENMIN RIBAO in Chinese 26 Aug 83 p 1

[Commentator's article: "Plant Trees To Fight Sand Erosion"]

[Text] Sand is the natural enemy of arid areas. Sand erosion is a fatal threat to arid areas. A sandstorm can submerge a number of villages and large areas of farmland. In the broad arid areas in Nei Monggol and in the northwest region, the annual rainfall amounts only to 50 mm or so, but the annual rate of evaporation reaches as high as in the region of 2,000 mm, which is the crux of the arid areas.

It is gratifying that although the very vast stretches of arid areas threaten the people, the people have never been daunted by them. The saying "there are no flying birds in the sky and no human traces on the ground" can only be certified to be half-true. In those vast Gobi and other desert areas stretching to the horizon, it is true that the birds and beasts are nowhere to be seen, but men are there, and flocks of sheep and camel herds are there, lively and flourishing. There, in the most arduous circumstances, our diligent and brave herdsmen, the hard-working PLA, working personnel of various trades and professions, and scientific personnel doing various kinds of research work, all of them are persevering in a common effort in safeguarding and building the frontiers of our motherland.

More gratifying is the fact that our party's policy is becoming more and more practical, thus continuously bringing into full play the initiative of the broad people in arid areas. Here, there are not only the precious experiences of the method of sand solidification without irrigation and sand control with water diverted from the Huanghe River successfully conducted by Shapotou scientific research station of Lanzhou sand control research institute under the Chinese Academy of Sciences, but also the large-scale popularization of the experiences of Zhongwei County of Ningxia (as reported in RENMIN RIBAO 17 August page 1) and the typical example of large-scale sand control by well irrigation conducted by Yaotan grain and grass base of Alashan Zuo banner in Nei Monggol, carried in today's RENMIN RIBAO. For many years on the vast tract of open country of more than 80,000 square km, under the threat of the two great deserts of Maowusu and Kuqibu, the cadres and masses have persisted in their struggles for sand control, endured the test of severe droughts for 4 consecutive years, achieved great results, and advanced victoriously with ever-increasing confidence. This is because Nei Monggol Autonomous Region, beginning in 1979, has resolutely practiced the responsibility system in the production in agriculture and animal husbandry, and continuously summarized experiences and perfected its implementation. With respect to animal husbandry, the system has been carried out in the form of contracts for livestock, grass fields, and reclamation of wastelands, with draught animals mainly raised by private households. After confirmation of forestry and animal husbandry as the main undertaking, efforts have been exerted to eliminate the influence of the "leftist" doctrine of

taking grain as the key link. In highland areas, resolute measures are taken to give up farming and restore livestock breeding, and to plant trees and grass, especially the ning-tiao [2899 2742] shrubs. Relatively comprehensive experiences have later been developed, such as three kinds of cultivation (the cultivation of grass, shrubs, and arbores, with shrubs as the main element) and five small items (small drainage area management, small grass storage facilities, small wells, small economic forests, and small tractors). This series of correct policies and measures has demonstrated great force. Shrubs, grass, and forest areas have each been developing at a speed of two million mu per year, and during the droughts for 4 consecutive years, numerous victories have been won in the struggle. The adverse current of sand advancing and men retreating in past years has been checked, and a prosperous scene of men advancing and sand retreating has emerged.

In regions such as Yijinhuluo Banner, traveling for more than 200 kilometers in a car, one can only see ridges of green hills and furrows of verdant trees, just like the very scene emerging at the south of the Changjiang River, with few conspicuous dunes even if one gazes into the distance.

Sand is an arch enemy. It will advance if you do not fight back. Sand erosion will occur without afforestation. Confronted by the threat of sand erosion, it is a life-or-death struggle against nature in arid areas whether we make use of afforestation to fight the threat of sand erosion, to force it back, and to restrain it, or just let the threat of sand erosion magnify with an attitude of indifference, carelessness, or despondency. It is regrettable that not all our comrades have the fighting spirit with a high degree of vigilance and tenacity. The pernicious "leftist" influence of being both large and collective and taking grain as the key link has not been cast off completely, and therefore due attention should be paid to this phenomenon.

The struggle between afforestation and sand erosion is an arduous and long-term struggle in arid areas. We should do our utmost and employ every means to expand afforestation and combat sand erosion!

CSO: 4008/220

RENMIN RIBAO ON ADVANTAGES OF IMPROVED ECOLOGY

HK190919 Beijing RENMIN RIBAO in Chinese 18 Aug 83 p 2

[Commentator's article: "Plant Grass and Trees in Order To Eliminate Poverty and Become Rich"]

[Text] Our country is full of mountains, and mountainous and undulating areas account for two-thirds of the total territory of our country. Mountainous areas are rich in natural resources, thus providing favorable conditions for a diversified economy. How to utilize the favorable conditions of mountainous areas and to exploit the resources there are of great significance to attaining the strategic goal of quadrupling the gross agricultural and industrial output value.

At present, party committees in many localities have put the question of developing mountainous areas on their agendas. They have formulated plans and put forth measures, and some of them have already made achievements in this respect. The building of mountainous areas involves complicated problems. It is right for various localities to proceed from reality and have different approaches with different stresses. However, there is a common essential point -- great importance must be attached to ecological balance. In places where soil erosion is serious and the ecological balance has been greatly upset, restoring and creating a good ecological environment is of utmost importance in building mountainous areas. No matter where we are developing mountainous areas, we must not repeat past mistakes. A good ecological environment is a basic condition for developing agriculture, forestry, animal husbandry, and sideline production. It is also a matter of fundamental importance involving the people's livelihood and the happiness of generations to come. We must have a clear understanding about this.

In the past, the people in Bijie paid an enormous price in "marching into barren mountains," "making high mountains bow," and making "artificial plains." In particular, one-sidedly grasping grain production reclaiming steep slopes, and destroying forests to increase farmland greatly reduced the area of forests. Besides, digging up turf to make compost caused soil to be washed away by water, leaving exposed rocks behind. All this went against the law of nature and greatly upset the ecological balance. We were relentlessly punished by nature for doing so. At that time, places where these activities were most enthusiastically carried out were most seriously damaged. Hezhang County -- Guizhou's typical example in learning from Dazhai -- is a country of the Bijie Prefecture where soil erosion was most serious. Guided by the party ideological line of emancipating the mind and seeking truth from facts, the Bijie Prefectural CPC Committee recalled its past lessons, broke through "leftist" conventions, changed the policy of grasping grain production alone, and effected a fundamental change in the guiding ideology and leadership methods.

The Beijing Prefectural CPC Committee has guided the building of mountainous areas with the viewpoint of restoring and maintaining ecological balance. This experience is well worth our attention. It has summed up experiences in afforestation, in planting grass, and in growing green fertilizer crops on farmland, and has summed up a series of experiences in maintaining ecological balance. The change from grasping grain production alone and destroying forests to reclaim land to planting grass and trees and effecting an overall development; the change from grasping grain production alone to managing, in a diversified manner, agriculture, forestry, animal husbandry, sideline production, and fishery; the change from a vicious cycle to creating a fine ecological environment...these changes conform with the desires of the masses as well as the objective law in building mountainous areas and have, in turn, brought about gratifying changes in eliminating poverty in Bijie's mountainous areas.

In the past, due to the "leftist" guiding ideology, Bijie was by no means the only place where the ecological environment was damaged. Therefore, seriously summing up past experiences and lessons; correctly analyzing the natural conditions in various localities; proceeding from reality and comprehensively improving conditions in mountainous areas; developing forestry, animal husbandry, agricultural, and sideline production in an overall manner; growing grass, shrubs, and trees at the same time; improving mountains and rivers; and planting grass and trees are of universal significance to various mountain areas.

CSO: 4008/220

RENMIN RIBAO EDITORIAL ON PROTECTING ECOLOGY

HK271144 Beijing RENMIN RIBAO in Chinese 25 Jul 83 p 1

[Editorial: "Attach Importance to Protecting the Agricultural Ecological Environment"]

[Text] China's agricultural ecological environment is becoming increasingly polluted as a result of the rapid growth of enterprises run by communes and brigades and the ample use of pesticides and chemical fertilizer in the countryside. Meanwhile, water and soil erosion have disturbed the ecological balance of agriculture in some areas, a result of the incessant felling of forest trees and the irrational exploitation and use of agricultural resources. This is now aggravating the basic conditions of agricultural production. It has become a problem calling for immediate solution in the country's socioeconomic development.

A good agricultural environment is indispensable to the existence of the 800 million peasants in our country and is the base of agricultural production. Our country has a vast population but not enough arable land; it is the basic policy of the state to protect agricultural resources and to maintain ecological equilibrium. This is of far-reaching significance for the country's economic development and the nation's prosperity. At present, leading comrades in some areas have no knowledge of agricultural ecology and fail to give first place to the protection of the agricultural ecological environment. They usually adopt measures for the development of production but take no care of environmental protection. Some comrades even say that at present, efforts should be made to develop agricultural production and to reinvigorate the rural economy, but that it is still too early to work for the protection of the agricultural ecological environment. It is wrong to set the development of current farm production against the protection of the agricultural ecological environment. The destruction of the agricultural ecological environment is a threatening danger; it involves the whole situation and yields infinite influences. Once the agricultural ecological environment is wrecked, it is very difficult to improve and restore it again; it is even impossible to restore it again in some places. The destruction of the agricultural ecological environment affects the existence and development of our descendants. The continuous development of the economy depends on natural resources and the ecological environment. Conversely, the destruction of natural resources and the deterioration of the ecological environment in rural areas surely

affect economic growth and set back the smooth-running economy in the countryside. If we will be compelled to take measures at that time, not only would we have missed an opportunity because of a delay, but we will also pay a higher price.

We must combine immediate interests with the long-term ones and individual or local interests with the overall ones, and carry out the principle of "combining prevention with protection, with stress on the former" so that we "should not have to make a cloak when it begins to rain." We must make every effort to protect the agricultural ecological environment while promoting the rural economy.

To prevent pollution caused by enterprises run by communes and brigades is important to the protection of the agricultural ecological environment. With the development of the rural economy, it is imperative for communes and brigades to build more enterprises. If such a trend develops blindly, it will inevitably pollute and wreck the agricultural environment. For this reason, we must strengthen leadership, work out plans, tighten control over management, and bring the establishment of commune-and-brigade-run enterprises into line with agricultural zoning and the construction plans of town and country. In accordance with local natural resources, technical conditions, and environmental situation, we must guide the direction of the development of commune-and-brigade-run enterprises, readjust the industrial structure and the product mix, improve distribution of industry, encourage the development of the production of consumer goods which are based on agriculture and aquaculture, and promote service trades that have no pollution or have less pollution for the benefit of production and livelihood of rural and urban people. Restrictions or prohibitions must be imposed on the development of commune-and-brigade-run enterprises which bring about horrible pollution, and efforts must be made to prevent some outmoded, backward, or foully-polluting equipment or enterprises from being transferred from cities to the countryside. Meanwhile, plans must be mapped out to transform commune-and-brigade-run enterprises which have long brought about heavy pollution to their surroundings.

The crux to the protection of the agricultural ecological environment is to energetically protect agricultural resources. We must make the geographical distribution and structure of agriculture more rational, according to the law of the natural ecological environment. We must make full use of such rich agricultural resources as mountain areas, hilly lands, forests, grasslands, and the water surface. Meanwhile, we must vigorously exploit such energy resources in rural areas as small hydropower stations, marsh gas, wind power, solar energy, and fuel forests. The comprehensive development of agriculture, forestry, animal husbandry, sideline production, and fishery is a suitable method to maintain the benign cycle of the agricultural ecological environment and to achieve better economic returns. At present, we have a lot of things to do in this respect, such as prohibiting the destructive felling of forests, banning the destruction of vegetation, having a general afforestation movement, increasing vegetation, protecting against soil and water erosion, and building ecological defense. We must take effective measures to protect soils against pollution by using less pesticides and chemical

fertilizer. Instead, we must advocate traditional biological control of plant diseases and the use of compost made of stalks and farm manure so as to improve the quality of soils and to increase soil fertility. We must educate the masses to know the fact that our country has a vast population but not enough arable land, to value every inch of land, and to strictly control housing on cultivated land. Meanwhile, we must pay attention to the protection of water resources, resolutely check all irrational and destructive exploitation of waters, protect biological resources, safeguard all kinds of rare living things, and work out plans to designate nature protection areas for various kinds of plants and animals so as to promote the multiplication of all living beings.

At present, the key to the protection and improvement of the agricultural ecological environment lies in leadership. Leading comrades of agricultural departments at various levels and of counties (districts) must place the protection of the agricultural ecological environment on their work agenda. Consideration must be given to both the development of production and environmental protection, and overall arrangements must be made. All departments concerned should closely coordinate and cooperate and make common efforts to lay a good material foundation for the overall revival of the country's rural economy.

CSO: 4008/219

CHANGES IN THE NATURAL ECOLOGY OF HAINAN ISLAND EXAMINED

Shenyang SHENGTAIXUE ZAZHI [JOURNAL OF ECOLOGY] in Chinese No 2, 1983 pp 40-43

[Article by Tang Zhongzhi [3282 0112 0037], Forestry Bureau, Hainan Administrative District, Guangdong Province: "Problems in Hainan Island's Natural Ecology"]

[Text] Hainan Island located to the south of the Tropic of Cancer is on the northern fringe of the tropics and is part of the Malayan tropical zone. It is located between $18^{\circ}9'$ and $20^{\circ}11'$ north latitude, and $108^{\circ}36'-111^{\circ}3'$ east longitude. Its area totals 51.15 million mu. Average annual temperature is $23-25^{\circ}$ C. It gets 2,000-2,400 hours of sunshine annually, 120-140 kilocalories (per square centimeter per year) of heat annually, and 1,600-1,800 millimeters of rainfall. It has a tropical monsoon climate and is the finest tropical zone in China. However, since the 1970's natural disasters have intensified causing some experts to evaluate and analyze the present state of the ecological environment and its causes. The writer's view is that an imbalance has occurred in the natural ecology and that part of it has deteriorated. This is closely related to destruction of forests, particularly the sharp decline in natural forests. Now let us take the three ecological studies in which I participated that were organized by interested units such as the central government and the province, prefecture science commissions, agricultural commissions and science societies and discuss my own views along the following five lines.

1. Changes in the State of Moisture Balance

Hainan Island has copious rainfall and abundant water resources. Rainfall averages between 58 and 61 billion cubic meters annually, and annual runoff is between 36 and 37 billion cubic meters. Even in low rainfall years, runoff is still more than 17 billion cubic meters. Figuring a 40 percent utilization rate, somewhat more than 14 billion cubic meters is put to use, or a minimum of somewhat more than 7 billion cubic meters. Currently agriculture and industry need about 6 billion cubic meters. Thus, supply of water resources is greater than demand. The problem is that rainfall distribution is unbalanced in time, between 80 and 90 percent of its falling during summer and fall, only 10 to 20 percent falling in winter and spring. Rainfall also

frequently varies from place to place from one to many times. Changes from year to year are more than 20 percent, including a relative rate of change of 38 percent during dry seasons. If analysis is done of extreme years in different areas, sometimes the difference is more than 10 fold. At Sangengluo in Wanning County, for example, rainfall in 1964 was 3,824.6 millimeters, but Basuozhen in Dongfang County got only 275 millimeters in 1969, the former getting 13.9 times more than the latter. Unevenness in amount of rainfall causes huge variations in amount of runoff. For example, annual runoff in the Wanquan He totals as much as 1,900 millimeters, but in the northwest along the seacoast, it is only 300-400 millimeters. The gap in the ratio between volume of flow during high water and lower water is sometimes more than 5,000 times. For example, at Baoqiao Station on the Changhua Jiang, in 1977 the flow crested at 28,300 cubic meters per second but in 1969 and 1977, flow during its lowest ebb flow was only 5.37 and 5.54 cubic meters per second respectively for a 5,270 fold difference in flow between crest and ebb. Objectively, this makes for drought and waterlogging disasters.

Speed of runoff is closely related to volume of runoff and to topography, configuration, soil, vegetation cover, and engineering facilities. Of all these things, it is forest cover whose role is most obvious in changing the form of runoff and the time required for convergence. It is able to cause 50 to 80 percent of the water volume to sink into the ground to moderate flow. Measurements have shown that it takes 6 to 8 months for groundwater to flow 1 kilometer. When rainfall is very intense causing a lot of surface runoff, its speed of flow is also moderated, going only 250 meters per hour. In places without forests, rivers frequently rise and fall suddenly. Once the dry season arrives, a shortage of water resources ensues causing a drought disaster. Therefore, if Hainan Island had a fine forest cover, that would very greatly change the proportional distribution of natural precipitation. Groundwater runoff would increase, and surface runoff would decrease. In addition the time required for convergence would be lengthened, thereby ameliorating droughts or reducing flood disasters.

When we conducted a study in the Beiwangling forest zone, we came to realize that the Baijing forest formerly consisted of more than 17,000 mu of natural forests, that brooks ran through the forest, and that a huge waterfall cascaded in the upper reaches. Following the felling of trees during the mid-1960's, the amount of water diminished, the size of the waterfall decreased, and the water level in the lower reaches dropped. However, following 5 or 6 years of revival of the cutover land, plus the afforestation of more than 2,000 mu of nearby bald mountains, the hydrological situation and the natural landscape were gradually restored. However, as a result of slash and burn farming over wide areas in recent years, 70 percent of the restored forests have been destroyed. Even some large trees (some more than 1 meters in girth) that had been preserved on the top of a mountain, as well as the surrounding man-made forest have been totally destroyed. This has resulted in a return to a shortage of water resources and the virtual disappearance of the waterfall. Ultimately, it impaired early crop production in Dazhang and Yilao production

brigades. This situation has also had a strong impact on mountain region communes in Ledong and Wanning counties, showing that the balance of water resources changes as the ecological system changed. It also shows that changes in the forest ecological system ramify into changes in the ecology of small basins and farmlands.

Sole reliance on afforestation in order to increase the utilization rate of water resources on Hainan Island will not suffice; large scale water conservancy construction must be done. Much has been accomplished in this regard already, and 2,807 projects for the impounding of water now exist throughout the region. Total reservoir capacity is 4 billion cubic meters, and effective capacity is 3.96 billion cubic meters. However, since full equipping of projects, management and maintenance have not kept pace, effectiveness in irrigation is still not what it should be. In addition, forests in the upper reaches and surrounding numerous reservoirs have been seriously damaged causing sudden rises and falls in flood peaks, which places an added burden on reservoirs in discharging flood waters, and wastes large quantities of water resources. Furthermore, once the dry season arrives, the volume of flow entering reservoirs declines, and water resources seem inadequate, thus increasing the irrigation burden. Changes in average flow into the large Songtao and Wanning reservoirs during flood and dry seasons are shown in Table 1.

Table 1. Average Flow Into Reservoirs During Flood and Dry Months

Name of Reservoir	Songtao Reservoir		Wanning Reservoir	
Decade	1960's	1970's	1960's	1970's
Statistical Value				
Flow (Cubic meters per second)				
Average inflow during September (a representative high water month)	149	155	43	61
Average inflow during March (a representative low dry season month)	5.01	2.90	5.70	3.54

Comparison of peak flood volume of flow and lowest ebb volume of flow for three large rivers is provided in Table 2.

Table 2. Average Annual Peak and Lowest Ebb Volume of Flow

Name of River	Nandu Jiang (Fucai Station)		Wanquan He (Chengpo Station)		Changhua Jiang (Maozhi Station)	
	1960's	1970's	1960's	1970's	1960's	1970's
Decade						
Statistical value						
Volume of Flow (Cubic meters per second)						
Volume of flow at flood peak	1,260	2,130	1,830	2,490	1,520	1,660
Volume of flow at lowest ebb	2.02	1.38	10.0	8.95	4.39	3.95

The effect on the water table was also very noticeable following destruction of forests. In our study of the Songtao Reservoir, all we saw was barren mountain ranges with only a few clumps of bushes and remnant trees remaining. A person in charge of managing the reservoir's dam said that the reservoir area had formerly been a sea of trees and, as of 1964, the area near the dam was still a luxuriant forest and the ground water had been extraordinarily abundant. A well less than 2 meters in diameter could supply drinking water for more than 1,000 people at that time. But now that the forested mountains have become bald, the situation is completely different. The water table has fallen greatly; water needed by several tens of people is in extremely short supply; and wells are almost dry. The same situation also occurred at Qicha Commune in Changjiang County, and is very common throughout the island. As a result, every time a drought occurs, between 4,000 and 5,000 wells go dry, and between 50,000 and 60,000 people have trouble getting water. This shows that the problem is not the result of failure to repair the wells, but a drop in the water table.

2. On Changes From Scouring of the Soil

We saw in the course of the study that scouring of the soil has been fairly widespread. At Wangxia Commune in Changjiang County, Fanyang Commune in Ledong County, and Maoyang Commune in Qiongzong County, numerous mountain forests have been denuded or burned bare. The soil is exposed and erosion is serious. At Cha Shan in the area of Maoan in Baoting County, where reclamation and cultivation has been going on for some years, and at some rubber groves growing on slopes in Dan County and Ledong County, scouring that has caused gullies has appeared, and some years they are more than 2 centimeters deep. The soil is infertile, and crops do not grow well.

More seriously, with each rainy season mud and sand slides occur, which not only make streams turbid, but also damage farmlands and water conservancy facilities. In 1977, strong winds and torrential rains in Baisha County caused a bald mountain to collapse destroying 559 water conservancy facilities and 12,000 mu of farmland, smashing 1,221 buildings, and killing 59 people. The Baocang turbine-pump station built on the Wanglou He in Ledong County in 1970, and which has a 5-meter high dam, has also been silted up over the years until the silt inside the dam is virtually as high as the dam itself. As a result, no water could be pumped from it for irrigation last year.

Additionally, analysis of hydrological data shows a trend toward increase in both the average silt content and the amount of silt carried annually in the Wanquan He and Changhua Jiang. Details are provided in Table 3.

Table 3. Annual Average Silt Content and Amount of Silt Carried

Name of River	Wanquan He (Jiaji Station)		Changhua Jiang (Baoqiao Station)	
	1960's	1970's	1960's	1970's
Decade				
Statistical values				
Amount of Silt				
Annual Average Silt Content (kilograms per cubic meter)	0.078	0.138	0.185	0.240
Annual Average Amount of Silt Carried (1×10^5 tons)	38.6	58.7	89.8	90.2

Observations made by the Tropical Forestry Institute of the Chinese Academy of Forestry Sciences show that the results of slash and burn agriculture show up in the same year. Soil erosion averages a depth of 1.86 centimeters per mu, and 1,320 kilograms of organic matter, 67 kilograms of complete nitrogen, 1.1 kilograms of quick acting phosphate, and 11 kilograms of quick acting phosphate are lost. This equals 317 kilograms of ammonium sulfate, 6 kilograms of calcium superphosphate, and 18 kilograms of potassium chloride. Figured in terms of 1980 statistics that showed 260,000 mu of slash and burn farmland in the autonomous prefecture, that equals a loss each year of 88,660 tons of the aforementioned kinds of fertilizer.

In a book titled, "Fertilizing of Rubber Forests" from the South China Tropical Crops Institute, the following description was given: "...when land is first reclaimed, the surface of the soil usually has a 3 to 4 percent organic content. In 1975...analysis of 126 soils with high stands of trees in Hainan and Zhanjiang showed most such soils to have about 2 percent organic matter, and that Hainan hill region rubber groves showed a 1 to 2 percent general decline as compared with when the land was first reclaimed. In an academic report titled, "Development of World Natural Rubber Production and Technical Measures for Increasing Rubber Output From Civilian-run Rubber Groves," the South China Tropical Crops Institute pointed out: "It is difficult to accumulate fertility in rubber grove soil, but it is easy for rainfall to leech fertility from the soil surface. Experiments conducted by our institute show that when the gradient of rubber groves is about 8 degrees and the soil surface is exposed, a downpour of 100 millimeters of rain washes away 350 kilograms per mu of soil. Figuring a nitrogen content of 0.8 percent, this means a loss of 10 kilograms of ammonium sulfate. Such a loss cannot be easily compensated through fertilization.

3. Changes in the Microclimate

Reports from everywhere state that Hainan's climate has become dry and hot in recent years, and that this is particularly true of winter and spring. This is related to changes in the climatic system, and is also related to the destruction of forests. In the course of the study, the Tropical Forest Institute reported that once natural forests have been destroyed, air temperature rises 1.5-3°C; soil temperature rises 3-8° C; and relative humidity drops 10-20 percent. Meteorological data from Baoxian Farm in Dongle County for 1970-1979 show an increase in amount of evaporation from 1,606.3 millimeters to 1,993.7 millimeters, including a maximum year 2,191.7 millimeters. Moreover, in a 10-year period, 3 years had 159 days of rainfall each year; all others had less than this number, the lowest year having only 122 days of rainfall. Dan County also reported that the county had 600,000 mu of natural forests during the 1950's, but that only 20,000 mu now remain. Despite the replacement with 450,000 mu of rubber forests and 270,000 mu of other man-made forests; nevertheless, the composition and quality are different resulting in a more arid climate and hotter weather. It has been calculated that the number of days in which Dan County has gone without rain for more than 100 days increased from three times in the 1950's to nine times in the 1970's. Additionally, it has been demonstrated many times that the thunderstorms in southwestern Wanning County are forest type rains caused by the local microclimate. Analysis of data shows the relative incidence of soaking rains (those that produce more than 3 millimeters of rainfall) to have decreased to 45.7 percent in the 1970's from 61 percent in the 1960's, and the absolute number of soaking rains declined 46 percent from the 1960's. Local meteorological departments and the masses generally acknowledge these changes to be closely related to a reduction in natural forests, and they emphasize that the real significance of this precipitation lies not in its volume but in its timeliness and effectiveness. As the ancients said: "A good rain falls in the right season. It should come in the spring and be borne on the wind through the night, wet the crops, and be so fine as not to make a sound."

All the foregoing situations fully demonstrate that the effect on the ecology of the relationship between natural forests and the microclimate is far superior to that from any man made forest of like area or smaller area. Of course, the effect on microclimate of air circulation cannot be ignored, but atmospheric circulation does not exist in isolation. It is closely inter-related with solar radiation and the nature of the cushioning surface beneath, and is both mutually related and mutually restricted. Forests are a special kind of cushioning surface, and when forests are destroyed, changes occur in the nature of the cushioning surface bringing about an increase in the reflectance rate, and a change in air currents rising from the ground surface, and causing a decrease in the amount of rainfall over a portion of the area. Consequently, one cannot proceed solely from macroclimate concepts to depreciate the role of forests in improving the microclimate.

4. Changes in Agricultural Calamities

Quality of an ecological environment is reflected directly in the frequency and size of calamities in agricultural production, and the influence of weather is but one objective external factor. Hainan Island has high temperatures and much rainfall. Organic matter decomposes rapidly, and there is much runoff. Unless "nurture of the soil" is taken in hand and organic matter constant replenished, and the role of forests in improving soil brought into play, a deterioration of soil fertility must inevitably occur. Agricultural departments have reported a less than 1 percent organic content of Hainan's paddy rice fields, and a lack of effective components such as nitrogen, phosphate, and potash in 73 percent of the farmland area.

Destruction of forests also directly affects reproduction of birds, causing a decline in "natural enemies," and an increase in insect pests. Statistics show an annual pest infested area of no less than 20 percent, and when the weather is dry and farmlands lack water, the number of rat pests increases causing definite losses for agricultural production.

Even more important is that once large amounts of forests were destroyed, the frequency of drought and waterlogging disasters increased in Hainan. For example, up until the 1950's, a spring drought occurred once every 2 to 4 years, and a summer drought occurred once every 2 or 3 years going from west to east. Since the 1970's, however, in 10 years there have been eight spring droughts and six summer droughts. A look at the degree of disaster shows that up until the 1960's the drought stricken area averaged no more than 800,000 mu. In the 1970's it increased to an average 1.1 million mu, including 1.4 million mu during the final part of the decade. During the first year of the 1980's, it increased to 1.65 million mu. In 1980, there were numerous fall typhoon rains, but in 1981 the area affected by spring drought was still 1.16 million mu, with not the slightest trend toward moderation. On the other hand, a look at the natural irrigation situation likewise shows the development of drought. For example, Qiongzhou County in the Wuzhi mountain region formerly had only 6,000 mu of farmland that lacked water; today the amount has increased

to 31,000 mu. During the early 1950's, the naturally irrigated area of Dan County, Yai County, and Baoting County was 211,900 mu. By the end of the 1970's, it had declined to 77,400 mu. Another example is from Wanning County in the eastern part of Fengshui Prefecture where six drought years occurred during the 1960's and 1970's. Furthermore, drought usually began in February, and the drought stricken area reached 40 to 50 percent of the county, and sometimes more. The foregoing facts show drought to be a major calamity in Hainan Island already. However, fall waterlogging should not be ignored either. Again, take Wanning County as an example. In 1978 and 1981, 42.5 and 50.7 percent respectively of the late crop area in that county was waterlogged. Thus, if it isn't drought, it's waterlogging has become a law.

5. Changes in Species Resources

Tropical forests are centers for the development of species, and Hainan's natural forests hold abundant specie resources. However, the steady destruction of forests has brought about a deterioration of the environment, and some species have already declined greatly, are on the verge of extinction, or have already become extinct such as luoshi [5953 1395] and meicao [7199 5430]. The writer has written a special treatise on this subject (see "Compilation of Hainan Island Forestry Resources," p 93, by the Survey and Planning Bureau, Ministry of Forestry), which will not be repeated here, but only drawn upon!

In summary, the ecological situation on Hainan Island is far from ideal. In an overall sense an ecological imbalance may be said to have occurred. Of course, balance is relative, but imbalance is absolute. Going back into the history of Hainan Island, ecological problems have been since early times a part of the special geographical environment and calamitous climate. During Ming and Qing times, a major drought occurred once every 11 years, and a major waterlogging occurred once every 12 or 13 years. But in those times the forest cover was fairly good and played a substantial role in warding off disasters; consequently disasters were fairly few and agricultural production was fairly stable. Subsequently, the forests were steadily destroyed, so that by the fourth decade of the 20th century, there were only 24.2 million mu of natural forests remaining, and the vegetation cover rate was 47.5 percent. By 1952, it had dropped to 18 million mu and a 35.5 percent cover rate; and by 1956, it had dropped again to 12.95 million mu, and a 25.7 percent cover rate. For geographically and climatically complex Hainan Island, this was unsuitable; and so once every 2 to 4 years a spring drought occurred, and once every 2 to 3 years a summer drought occurred. However, by now the natural forest has further declined to 4.97 million mu, 61.6 percent less than during the 1950's, and the cover rate is less than 10 percent. As time has passed more than 6 million mu of rubber trees and other undiversified man-made forests that are inferior to natural forests in ecological effectiveness have been planted. As a result, the weather has not changed substantially, and during the 1970's a slight increase occurred in the amount of precipitation,

but ecological disasters increased nevertheless to the point that eight spring droughts and six summer droughts have occurred during the past 10 years. Frequently, waterlogging has also occurred leading to a steady increase in the disaster affected area. This is where the nub of the problem lies. Therefore, in order to make the most of Hainan Island's natural advantages, it is necessary to accelerate afforestation and forest protection to maintain the ecological balance.

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CSO: 5000/4179

ECOLOGICAL BALANCE OF THE TARIM BASIN DISCUSSED

Beijing ZHONGGUO HUANJING KEXUE [ENVIRONMENTAL SCIENCES IN CHINA] in Chinese No 2, 1983 pp 35-37

[Article by Sun Changren [1327 2490 0088], Hydrogeology Engineering Geology Section, Ministry of Geology and Minerals: "Discussion on the Relationship Between the Hydrogeological Environment and the Ecological Balance of the Tarim Basin"]

[Text] The Tarim Basin is China's largest inland basin. Most of the oases along the fringes of the basin are major economic centers of southern Xinjiang and include places such as Kashgar, Khotan, Aksu, and Korla. Archeological evidence shows that as long as 1,500 years ago, our ancestors penetrated to places about 100 to 150 miles inside the desert where they opened farmlands and built redoubts. Data show that in the south about one-third of the time there is windblown sand for a maximum of 145 days each year. Wind velocities are between 1.5 and 4 meters per second, and as high as 16 meters per second. Windblown sand engulfs houses, buries good farmland, and blocks roads. Frequently, the Khotan-Ruoqiang Highway is choked with sand and impassable. The record also shows that during the most recent 1,000 to 2,000 years, the desert has moved 70 kilometers southward, and continues its southward advance to this day. Additionally, as science and technology have developed, mankind's influence and role on the natural system has become increasingly great, sometimes overstepping or violating natural laws and destroying the natural ecological balance. This has led to the rapid degeneration and death of drought tolerant vegetation cover such as large numbers of diversiform-leaved popular [popular diversifolia] groves, with consequent acceleration of desertification.

I. The Hydrogeological Environment

(A) Formation and Use of Groundwater

The groundwater in the plains at the foot of mountains comes mostly from the penetration into the soil of surface runoff from mountain regions. The replenishment, runoff, and drainage, and the beginning and end points of streams in the region all reveal a pattern that is synonymous with changes in the lithofacies. At the top of the tilted plain at the foot of the mountains, the groundwater is buried deepest,

and may be anywhere from several tens of meters to more than 100 meters down. In the middle part of the basin, the water table gradually becomes more shallow. The Gobi gravel belt of the mid and upper parts of alluvial and diluvial fans are phreatic water runoff areas where the water table is anywhere from several meters to 10 meters deep. Near the edges of the alluvial and diluvial fans phreatic water overflow belts form that drain away through numerous springs and marshes or through the evaporation of salt marshes. The vast alluvial and diluvial plains are drained largely through evaporation and present a picture of salt deserts and salt marshes. In the middle of the basin, water quality is bad in both surface and deep layers. Only a narrow desalinated belt near the surface water may be used, but quantities are not large. In short, both surface water and ground water are unevenly distributed in both time and place. It is noteworthy that in this arid area so extremely lacking in water, groundwater resources are more important than any other mineral resource. Though abundant mineral resources exist within the basin, and though there is vast cultivatable land, grasslands, and forests, either the lack of water or its uneven distribution in the region makes their development impossible.

(B) Decline of Groundwater and of Diversiform-leaved Poplar Groves, and the Effect on Ecological Changes

Diversiform-leaved poplar groves are distributed mostly in the middle and upper reaches of river basins such as the Tarim, and they are also distributed over large areas along the southern fringe of the basin. Like other plants and forests, they grow in moist soil conditions. Thus, when natural conditions are dry, they are able to grow only along both banks of streams or in the middle and upper reaches of rivers. We are able to observe the pattern of change in water tables and growth of diversiform-leaved poplar groves through a sectional view of the floodlands of the Tarim, Khotan, Yeerqiang and Kongque rivers, to first and second grade terraces, and on to the plains. It is not difficult to see that as the water table drops, diversiform-leaved poplars gradually decline. Under normal conditions, when the water table is about 3 meters down, diversiform-leaved poplars grow very well; at 4 meters bad affects appear; and at 4 to 5 meters, the trees begin to yellow. At 6 to 9 meters, they begin to wither, and below 9 meters, most die. Statistics for the past 20 years show a decline in the diversiform-leaved poplar grove area from 45.98 hectares to 17.48 hectares, largely as the result of the large scale clearing of land and destruction of forests to make farmland within the basin, the damming of flood waters and diversion of streams, and flood irrigation that has further increased the amount of evaporation. This, plus reckless felling of trees and denudation has brought about a gradual lowering of the water table in the lower reaches of streams, the decline averaging between 0.2 and 0.25 meters over the past 10 years. The regression and death of diversiform-leaved poplar groves has resulted in changes in the ecological environment, a decline in

the soil's ability to hold moisture, and a loss of equilibrium in the climate of some parts of the area. In the Tarim River basin alone, an area of about 32.63 million mu or 61.8 percent of the basin area has become desertified to varying degrees. Soil desertification is the inevitable result of destruction of the ecological balance in arid areas. Today, the area in which diversiform-leaved poplars have declined, withered, or died far exceeds the naturally renewed area, and the ultimate result will be expansion of the desert.

II. Only Sensible Development and Use of Water Resources Can Maintain the Ecological Balance

The foregoing circumstances show that changes in the ecology of the Tarim Basin result from the multiple actions of both man and nature. The natural resources of the Tarim Basin create an abundant material foundation for mankind's life, existence, and development. In developing these resources for use, for a long period of time mankind has derived many valuable experiences in conforming to nature and in transforming nature. He has cleverly used the tilted topography and the way groundwater is buried at the foot of mountains, as well as natural slopes to create a system of wells connected by underground channels that is unique to Xinjiang for the sensible development and use of groundwater. However, during the past 10 years, as a result of fairly rapid development of national economic construction and lack of management experience, he has damaged the natural environment. This has brought about a proportional imbalance among various ecologies, inability to develop and use water resources sensibly, a gradual drop in the water table, a shrinking of diversiform-leaved poplar groves, windblown sand disasters, and acceleration of desertification. The obvious disappearances of the fine natural environment of the Tarim Basin must arouse the concern of departments concerned. Below several views are given solely from a hydrogeological point of view.

(A) To a very large extent, the development and transformation of this region will be determined by the use of water resources. For the past several years, hydrogeologists have carried out comprehensive hydrological surveys over wide areas of this region. The data confirm that water conservancy resources in the region, though not as abundant as soil resources, are by no means lacking. On the tilted plains at the foot of the Kunlun and Tianshan mountains alone are more than 10 streams, large and small. Even though streams are unevenly distributed by area and season, they serve an extremely important function in replenishment of groundwater, in afforestation and controlling sand, and in diversion for irrigation. As the streams penetrate into the middle of the desert, in particular, some of them traversing the basin and some of them disappearing in the desert, they improve the groundwater situation to a very great extent in desert areas. Therefore, all around balance, multiple use, improvement of management, and avoidance of water resources waste can solve the problems of competition for water among industry, farming, and animal husbandry, and between people in the upper and lower reaches.

(B) On the outer fringes of alluvial and diluvial fan areas, groundwater is not very far below the surface, and frequently, phreatic water wells over-flow. Natural groundwater resources are extremely abundant, and numerous cities, towns, industrial plants, and farms are located in this region. Here water can be supplied and drained readily, and vigorous development of groundwater for use helps bring under control secondary salinization of the soil and the creation of marshes in areas around the lower reaches; thus surface water should be diverted to the maximum extent possible to areas in the lower reaches.

(C) In desert fringe areas, phreatic water is strongly alkaline, but beneath there is fairly good groundwater that may be tapped for use. This helps lower the phreatic water table above; however, it is imperative to guard against mixing it with alkaline phreatic water. Phreatic water in alluvial areas of streams that penetrate into the middle of the desert are periodically replenished and washed by streams. Water quality is good and amounts are large. This water may be tapped to control secondary salinization.

(D) Most of the shallow groundwater that has penetrated into the middle of the desert and is far away from streams to replenish it is saline, and little of it may be used. In such areas, confined water must be found as sources of water supply. Though quantities of water are limited, they are extremely significant in transforming the desert, and fostering growth of diversiform-leaved poplar groves.

(E) Prudence should be exercised in impounding water in mountain passes or the upper reaches of streams. Conditions in such places do not favor engineering geology. The onslaught of silt in mountain torrents is fairly severe, and after water has been stored, evaporation is extremely intense, a large volume of water being lost. This loss inevitably impairs the amount of water in the lower reaches of streams and the amount of replenishment of groundwater. For example, measurements taken at Kuerlebeitiemen Pass on the Kongque River showed a water volume of between 1.219 and 1.435 billion cubic meters a year, but only 200 million cubic meters per year remain by the time the river reaches Weili County, and the flow stops in the lower reaches. Formerly, the Tarim River entered Luobu Lake, but for similar reasons the lower reaches have stopped flowing and have dried up. The water table has declined markedly; salinization of the soil has intensified; desertification has increased; and large numbers of diversiform-leaved poplars have died. All this shows fully that this regions' ecological balance has been markedly impaired.

III. Protection of Diversiform-leaved Poplar Groves and Maintenance of the Ecological Balance Demand Immediate Attention

Diversiform-leaved poplar groves most clearly characterize the landscape ecology of the Tarim Basin. Evolution and classification of their growth depends substantially on water conservancy resources and the degree of

desertification. When there was no human interference, they developed in conformity with nature to become one of today's riches in southern Xinjiang. But with the ever increasing expansion of human activities, man's role in manipulating and controlling development of the natural ecology became increasingly great, and his dynamic development, use, and even destruction caused these diversiform-leaved poplars to develop increasingly in the direction of decline and death, largely as a result of irrational use of water conservancy resources. Of course, there were other factors too, such as poor scientific care of the diversiform-leaved poplar groves. In terms of its ecological system, the natural environment of the Tarim Basin is facing a severe test, and we must not be indifferent to the dangers. We should not only study deeply the natural geographical, geological, topographical, and hydrogeological conditions that affect this region, but it is also imperative that we watch man's production activities, people's life styles, and other factors. This is to say that in studying the ecological environment of this area, we must consider in a comprehensive way both natural science and social science problems. This is the only way that good results can be obtained in repairing and transforming the natural environment of the Tarim Basin. Thus, we must demolish as quickly as possible sector ownership system management methods, adapt general methods to specific situations in considering the individual characteristics of different areas, work together, coordinate with one another, plan comprehensively, and manage, develop, and use the Tarim Basin's natural resources. This is the only way in which the already damaged ecological balance can be gradually restored and improved.

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CSO: 5000/4178

KEY TO MAINTAINING ECOLOGICAL BALANCE LIES IN PROTECTING, DEVELOPING FORESTS

Shenyang SHENGTAIXUE ZAZHI [JOURNAL OF ECOLOGY] in Chinese No 2, 1983 pp 53,55

[Article by Zhang Jianguo [1728 1696 0948], Fujian Academy of Forestry:
"Forestry Ecology Economics (2): The Natural and Economic Position of
Forestry Ecosystems"]

[Excerpts] State and Ecological Balance of China's Forest Resources

Statistics from the United Nations Food and Agriculture Organization show a 2.8 billion hectare forest area throughout the world now. This is a 29-percent average forest cover rate, and forest reserves total more than 300 billion cubic meters.

China is a country with few forests and lacking in timber. Its present forest area is only 1.83 billion mu. Its forests account for 12.7 percent of the total national land area and standing timber reserves total 9.5 billion cubic meters (usable resources amount to only 3.5 billion cubic meters). China occupies the 120th and 121st positions respectively in terms of forest cover rate and forestland area per capita among 160-odd countries and regions of the world, and it stands 57th in terms of standing timber reserves per capita. China has a large population and small forest resources that are unevenly distributed. Historically, destruction of the ecosystem has been fairly severe. Since Liberation, despite major efforts at artificial afforestation and accumulated afforestation of 90 million hectares, the mature forest area amounts to only 28 million hectares. Meanwhile reckless cutting and denudation, and destruction of forests to clear land for agriculture is extremely serious. Consequently, though supposedly we can supply large amounts of timber for the building of the national economy, overall effectiveness in forestry production has not been great and problems are numerous. The amount of forest resources annually felled for use, recklessly cut or denuded, destroyed to clear land for agriculture, or consumed by forest fires amounts to almost 200 million cubic meters, less than one-third of the amount being felled under state plan. Consumption outside of plan is very large, and waste of resources is great. On the one hand some primeval forests continue to be steadily plundered for use, and on the other hand achievements in afforestation have not been large. Thus, a crisis in serious ecological imbalance has come about, which is prominently manifested in the following ways:

1. Erosion, damage to reservoirs, and destruction of agricultural production bases.

Incomplete statistics show one-sixth of China's land area to be eroded. Every year, 5 billion tons of soil are washed away, and runoff nutrients equals between 40 and 50 million tons of chemical fertilizer. Erosion not only hurts agricultural production and the safety of the people's lives, but also endangers all the water conservancy projects that serve agriculture. Statistics show that in less than 20 years that 10 of the country's major reservoirs will be silted to 18.5 percent of their capacity, and quite a few small reservoirs have already become filled with silt and have had to be abandoned.

2. Development of desertification. Recent data show the country's desert area to have increased by almost 1 trillion mu since the period immediately following Liberation, largely as the result of denudation of forests, reckless clearing of grasslands, overgrazing, and the gathering of firewood. When grasslands and pastoral areas have lost their woodlands, the springs dry up; streams stop flowing; ground water gradually declines; the climate becomes bad; and disasters become frequent.

3. The climate becomes bad and disasters are serious.

4. Valuable tree resources are seriously damaged.

5. Rare animals verge on extinction, etc.

To summarize the foregoing, forest resources must be developed and used rationally, i.e., in accordance with the natural laws of growth of forests, the natural ecological balance being taken into account, and the forests used in a planned and sensible way. Unless this is done, just as the path we have taken has shown, the result will not only be a sharp decline in forest resources and scarcity of timber, but also an imbalance in the natural ecology, and an increase in natural disasters with serious impairment to the development of agricultural production, animal husbandry and the people's normal lives. It will also bring about a great decline in wild animal life, and cause the extinction of rare plant and animal life or be faced with the danger of extinction.

Running the Country's Forestry According to the Principles of Ecology Economics

It goes without saying that after correctly and scientifically understanding and evaluating the natural and economic position of forests, it is imperative that a thorough change in the guiding ideas of forestry operation will ensue, and that the guiding idea will change from "timber use" to the principle of "ecological use."

So-called "ecological use" means founding the guiding ideas of forestry operations on forestry ecosystem theories, taking beneficial ecological results as the goal of operations. This is because only from a foundation of maintaining

maximum beneficial ecological results is it possible to obtain a constant maximum flow of timber and other forest products. This means running forestry according to the principles of ecology economics.

The main requirement of this idea is to treat forest resources as a totality and as a self-contained functioning ecosystem, and by bringing into play the ecological benefits of the entire system, and by readjusting the relationship of all internal elements to be able to supply timber and all forest by-products. Only by bringing about an organic unity of ecological principles and economic principles is it possible to obtain maximum economic benefits.

In keeping with this requirement, all kinds of forests and trees such as mountain forests, the afforestation of plains, all sorts of shelter forests, trees in the four besides [beside streams, roads, villages and houses], and trees planted in cities must be placed under centralized management and planning. Equitable readjustments must be made of existing forest distribution in order to bring about gradually the optimum configuration in the distribution of forests and agriculture, industry and population, and the most suitable cover.

Since forest ecosystems have their own laws of development and since mankind's understanding of these laws has a long way to go to reach maturity, for a long time to come artificial intervention must inevitably cause a series of new problems. Because of the long-term nature and public benefit nature of forestry production, as well as its control by the socioeconomic system, in order to realize this ultimate goal mankind must pay a heavy price and go through a fairly protracted exploration and struggle.

However, we have no reason whatsoever to doubt the urgency of rescuing the forests and protecting the environment to promote ecological harmony. We have even less reason to abandon our efforts because China is poor, its techniques fairly antiquated, and because historically its forests have been seriously damaged.

China is a great socialist country in which concepts of the overall situation and the long-range evidenced in socialist scientific forestry management are very strong. The historic responsibility of protecting resources, maintaining ecological balance, and initiating a new situation in the building of socialism has fallen on our shoulders, and it is also an unshirkable responsibility to forest ecology economics science.

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CSO: 5000/4179

ENVIRONMENTAL, ECONOMIC, SOCIAL IMPACT OF FUEL FORESTS EXAMINED

Beijing NENG YUAN [JOURNAL OF ENERGY] in Chinese No 2, 25 Apr 83,
pp 11-13

[Article by Sun Jingbo [1327 2529 3134] of the Dongbei Forestry Academy:
"Reevaluating Forest Resources"]

[Text] For a long time, the major sources of energy in the world have been petroleum, coal, and water and electricity. But since the energy crisis of 1973 in the capitalist world, many nations have come to emphasize forest resources. People have reevaluated the role of forest resources which still play an effective role in society, and a trend of developing and utilizing forest resources as an energy source has gradually emerged. In the world today, most developed nations and more and more developing nations are actively developing scientific experiments on the technology to plant firewood forests and convert biological materials into energy.

The role of forests as an energy source and their significance in maintaining and improving the natural environment, and maintaining the ecological balance are growing day by day especially in such a developing nation as ours which has a population of one billion including 800 million peasants, and where there is an extreme shortage of energy for rural life.

Firewood Still Plays an Important Role in the World's Energy Structure

Although a period in which firewood is the main source of energy indicates a very low level of productivity, even today, about 1.566 billion cubic meters of trees are burned in the world (constituting 59 percent of the total amount of trees felled) each year. The energy provided by firewood accounts for 5.4 percent of the world's total amount of energy. This shows that firewood still occupies an important position in the world's energy structure today.

The proportion of firewood in the energy structure shows a nation's level of industrialization. In some developed nations, the amount of firewood accounts for 12.3 percent of the amount of timber felled and accounts for about 1 percent of the total amount of energy. But in the developing nations of Asia, Africa and Latin America, 80 percent of the timber

(about 1.42 billion cubic meters) is consumed as firewood each year. The energy provided by firewood accounts for about 20.6 percent of the total amount of energy, and this trend is rising steadily. This shows that in developing nations, especially in the broad rural areas, wood is still the most basic form of energy.

There is a lack of systematic understanding of the statistical data on firewood in China. It is difficult to make an overall and full evaluation. But according to rough estimates, at present, our nation uses 200 million cubic meters of forest resources each year, and about 70 million cubic meters are used as fuel, accounting for about one-third of the annual resource consumption. The nation's broad rural areas, especially the mountainous regions and semi-mountainous regions basically use stalks and timber as fuel. Almost all forestry workers and farmers in the key forest regions in the northeast and the southwest burn wood. Obviously, biological fuel always has been the main source of energy on the nation's farms and an important factor in rural development. But the use of biological material as fuel has a low thermal efficiency, and the widespread shortage of firewood is a difficult problem. Among the more than 170 million farm families throughout the nation, more than 70 million families lack firewood. The thousands of families in the broad rural areas, mountainous regions, grazing regions, on islands and in remote border regions often wantonly fell trees in order to solve the problem of firewood for cooking and for heating. This has caused deterioration of the ecological balance including soil fertility, water and forest resources.

The Development of Fuel Forests Suits Our National Conditions

China's rural areas have many energy sources which can be developed and utilized. Nature has provided abundant energy resources and there is a huge potential. There are many ways that can be selected to solve the shortage of fuel in rural areas. To sum up, we can follow the road of comprehensive development of fuel forests, marsh gas, small-scale hydropower, small coal pits, solar energy, wind energy, geothermal energy, tidal energy which have their own characteristics and form a multiple energy system. Based on different natural conditions and the actual situation in different regions throughout the nation, stabilization can be achieved by using many ways to solve the problem of fuel in rural areas with regional features in mind and, seek diversification in supplying energy for rural life. Fuel forests, as a link in the plurality of energy in the nation's rural areas, are a vital energy undertaking. The rejuvenation of forests shows the great potential in the prolonged production of firewood.

In China, the potential to develop forest energy is great, whether in the mountain regions, in the hilly regions, or in the plains and farming regions. We should recognize that fuel forests are not the only kind of forests that can solve the energy problem, timber forests, shelter forests, economic forests, and greening of the "four sides" can also solve a part of the problem in burning firewood after they are planted,

interfelled, trimmed, split, felled, and processed (residue, waste wood, sawdust). As science and technology develop, the rate of comprehensive utilization of waste timber will increase. Through the various types of scientific processing, products important to the national economy can be obtained from waste timber, and the final residue is a good source of energy. The potential of using timber to manufacture thermal energy is great, there are many ways, and the future is bright. A plan to build up energy centered around biological energy (such as marsh gas, and fuel forests) for rural life, to greatly develop energy from marsh gas and to actively develop afforestation is a plan that is practical, feasible and economically effective.

At present, the level of agricultural productivity in China is still rather low, payment in kind constitute a large proportion. Actually, agricultural production is still in a semi-self-sufficient state. Wages for labor in many regions throughout the nation are low, the income is low, and the economy is poor. In building forests not only is the technology proven, it is easy to carry out, it requires less investment, it consumes less energy, its results are fast, it has a practical significance in guaranteeing social safety and in stimulating economic prosperity, and it suits our nation's condition. Past practice in forestry production in the nation proves that in general, the cost of cultivating one mu of fuel forest including saplings and labor is only 10 to 20 yuan. The production cost is low, and many farmers can use their free time or surplus labor. Fuel forests generally can realize benefits in 3 to 5 years. At least each mu can produce 500 to 600 jin of firewood and higher yields can produce 1,000 jin or even several thousand jin of firewood per mu. The effective period of forest production is long. We can use the characteristics of continuous growth and renewal to realize the goal of reaping many years of benefits from one planting and afforestation.

Throughout the nation, 170 million farm families are scattered in the broad rural areas and remote mountain regions. The dispersed nature of fuel forest production is consistent with the dispersed nature of the user families. This benefits the local utilization of scattered biological fuel that is difficult to transport. This also benefits self-reliance, self-sufficiency and the conservation of labor.

The Potential To Develop the Reserve of Fuel Forests in China Is Great

China has unique conditions to develop fuel forests. The climate is suitable, there are many species of trees, there is a broad area suitable for planting forests, and there is an abundance of labor resources. They provide superior conditions for developing "green energy," and a great productive potential.

China is vast in territory, the geographical location is appropriate, illumination conditions are good, the duration of sunshine is long, and there is an abundance of light and heat resources.

The duration of sunshine in over two-thirds of the nation's regions is over 2,200 hours. Nationally, light and heat resources are especially abundant in north China, the northwest and the Qinghai-Xizang Plateau. In most of the regions in Heilongjiang at a slightly higher latitude, the annual number of hours of sunshine is between 2,500 and 2,700 hours. The total annual radiation per square centimeter is 105 to 115 kilocalories, equivalent to that in Guangxi, Hunan and Hubei, and northern Zhejiang and Fujian. Light and heat resources are abundant. The rich light and heat resources have created favorable conditions for the effective development of the potential of photosynthesis of green plants, for the maximum increase in the output of forest life and for the increase in biological energy.

There are over 20,000 species of woody plants in the world. Our nation has more than 8,000 species, and more than 2,000 main species of trees. North America has over 600 species of trees and Europe has 250 species. The world recognizes our nation as a treasure of tree resources. On the 9.6 million square kilometers of land, species of trees and shrubs that have a strong adaptability, that easily propagate and regenerate, that have lush growth of branches and leaves, that have a strong fire-power and that are suitable for firewood can almost be found everywhere.

Trees have a visible superiority in utilizing light energy to produce biological energy. In the ecological systems of various types of land vegetation, the total amount of solar energy captured by forests each year is 3.6 times that of grassland and 6.3 times that of farmland. Forests are an ecological system that have the highest efficiency of conversion in the utilization of solar energy. Compared to grassland and farmland, the amount of biological production by forests is the greatest.

We should also recognize that the area of the nation's territory is large, but the per capita national average share of land is less than 15 mu, only 30 percent of the world average of 48.5 mu. The per capita share of cultivated land is 1.5 mu, only 27 percent of the world average of 5.5 mu. The per capita share of forest land is 1.9 mu, only 12 percent of the world average of 15.5 mu. The per capita average of grassland is 5.1 mu, less than half the world average of 11.4 mu. Such a huge population has exerted a great pressure on the nation's natural resources and the present strength of the nation. This requires us to strictly control population growth on the one hand and at the same time we must fully utilize every piece of our land in such a nation of ours which has always relied on land and crops as the major resources. We should not concentrate most of our strength on one-tenth of the limited cultivated land.

Of the 14.4 billion mu of land in the nation, the area of cultivated land utilized amounts to only 1.49 billion mu, accounting for slightly over 11 percent of the area of the nation. There are broad expanses of mountainland, hilly regions, deserts and wasteland, and there are superior natural conditions for developing forests. According to estimates,

there are about 1.83 billion mu of land that can be further developed and utilized for agriculture, forestry and livestock production. Of this area, less than 500 million mu are suitable as farmland and artificial grasslands. There are another 1.2 billion mu of unclaimed mountains and wasteland suitable for afforestation that are left to waste year after year which have a large potential for forestry production. A forest is different from many agricultural crops. It can grow on infertile land, and can utilize small amounts of nutritional elements to produce a lot of timber. According to estimates, in places with better water and heat conditions, the biological substance converted from the capture of solar energy each year by one hectare of forest is equivalent to the thermal energy of 4 to 5 tons of crude oil.

Nature is a rich treasure chest. We should fully develop the favorable conditions in the nation where the labor resources are abundant and where the potential of land resources is great. We should suit measures to local conditions to develop diversification involving agriculture, forestry, livestock production, sideline production and fishery, and stimulate prosperity of the rural economy.

The Great Significance of Developing Forests

Forests, as a source of energy, have unique characteristics compared to other sources of energy. Because of the multiple uses of forests, the development of forests can realize many economic and ecological benefits.

1. Solving the Problem of Firewood in Rural Areas

The development of fuel forests can solve the problem of firewood in rural areas, and thus nearly 300 million tons of stalks (equivalent to 20 to 30 billion jin of grain) and 9 million tons of animal excrement used as fuel each year in the rural areas throughout the nation can be returned to the fields to regulate the physical and chemical properties of the soil, increase the organic matter in the soil, strengthen land fertility, and stimulate increased grain production. When forests emerge, raw materials for rural industries and sideline production can be increased, sideline production can develop and income will increase.

2. Maintaining and Improving the Ecological Environment

Forests are an important link in the entire ecological system. Enlarging the forest area not only is an important aspect in solving the energy problem in rural areas, it also has many social benefits surpassing the value of the energy itself.

Carbon dioxide has the greatest ecological significance in the atmosphere and it is a poisonous gas in the atmosphere. Green plants are the main consumers of carbon dioxide. According to estimates, green plants on earth consume 60 to 70 billion tons of carbon dioxide each year, equivalent to 25 percent of the total amount of carbon dioxide in the atmosphere. Forests have the unique function of absorbing poisonous gas and manufacturing oxygen.

Forests are also "green processing plants" of oxygen necessary for human survival. Because the absorption of carbon dioxide by photosynthesis during the day is more than 20 times the amount of carbon dioxide exhaled by breathing, the content of oxygen in the air is increased and the atmosphere is purified.

3. Maintaining Water and Soil Resources

In the environmental problem, it is very important to pay attention to air and water pollution, but a more serious threat is sand and soil erosion. Land is the foundation of human survival, and the formation of soil is very slow. A thin surface soil layer can be formed only after several centuries. When it is eroded, rocks are exposed, grass will not grow and is difficult to restore. How to expand the percentage of forest cover, strengthen the storing of water and preserving soil, and prevention of soil erosion should be regarded as the foremost problem in this nation of ours with an eroded area reaching as large as 1.5 million square kilometers and an annual soil erosion of 5 billion tons.

4. The Important Guarantee To Develop Hydraulic and Hydroelectric Power

In today's world where mineral fuel has been exhausted, hydropower can maintain a long-term and steady supply of electricity. Compared to coal, petroleum and nuclear energy, hydropower also has the advantage of protecting the environment. Hastening the development of the rich hydraulic resources will be the nation's long-range strategic goal.

The large rivers, the winding streams, and the large and small lakes, and reservoirs scattered throughout the large area of the motherland cannot persist for a long time without the protection of slopes of green plants, soil conservation and the storing of water. Forests are important guarantees to sustain the life of rivers, prolong the life of reservoirs and develop hydraulic and hydropower.

Today, we should change the traditional concept that forest resources are only for producing timber. We should reevaluate the significance of forests as a resource and an energy source, and in the environment, the economy and society. We should establish the best ecological balance on the 9.6 million square kilometers of land.

9296

CSO: 5000/4161

USING TECHNOLOGY TO PROTECT FORESTS, SOLVE RURAL ENERGY SHORTAGES

Beijing DAZIRAN [NATURE] in Chinese No 3, 1982 pp 38-39

[Article by Ye Yisen [0673 1150 2773]: "The Rational Development of Green Energy"]

[Text] The light energy irradiated by the sun upon the ground surface is equivalent to 20,000 times the total amount of energy consumed by humans. For hundreds of millions of years, such vast amounts of energy have created living organisms and bioenergy in the form of coal, petroleum, natural gas buried underground, but have left nothing else. Up to now, green plants are still the only effective storage of solar energy. On the best farmland, plants can convert 3 to 5 percent of solar energy into biological material energy. Photosynthesis can produce 172 billion tons (dry weight) of new growth of plants on earth each year. Therefore, biological material energy has become the most important regenerative energy for mankind.

While converting solar energy into biological material energy, green plants also greatly purify the environment. A square kilometer of forest can absorb 100 tons per day of carbon dioxide, 0.2 tons per day of sulfur dioxide, and trap 20 tons per day of dust. A forest belt of 40 meters wide can weaken 15 decibels of environmental noise.....aquatic plants can purify the water regions to a sizable extent, for example, the water hyacinth which has a very strong surviving strength can greatly purify agricultural sewage containing a high content of phosphorus and industrial sewage which contains a high content of heavy metals. Also, water hyacinth grown in a hectare of water surface can generate methane equivalent to the amount of energy produced by 60 kilograms of coal.

Therefore, we can say that green plants and the biological material energy they produce have an important meaning in the survival of the earth's environment and mankind.

But if people do not rationally develop and utilize biological material energy, this will lead to serious consequences and nature's ruthless retaliation. At present, the energy consumed by China's 800 million farmers for cooking, heating and some sideline production relies to a very large extent on stalks of

agricultural crops, firewood and grass and other biological material energy. The amount of stalks of agricultural crops is far from sufficient, and people have to fell trees and destroy forests to make up the shortage. This uncontrolled use of biological material energy will surely bring about massive destruction of the environment and ecological balance.

Such destruction will exhaust the regenerative ability of resources. The annual growth rate of all forests in China is 94 million cubic meters, but the actual annual loss of timber is as high as 200 million cubic meters, far surpassing the regenerated amount of forests; 70 million cubic meters of timber are felled for firewood, and 70 million cubic meters are destroyed by fire, and reclamation. The economic loss and the loss in scientific research due to the destruction of the regenerative ability of forest vegetation cannot be calculated or made up.

The abuse of biological material energy by man also aggravates soil erosion and destroys hydroelectric resources. According to a survey conducted by the Yunnan Tropical Plants Research Institute of the Chinese Academy of Sciences, after a heavy rain, the ground surface runoff on reclaimed land on mountain slopes is 24.8 times greater than that in tropical rain forest land, and soil erosion is 1,300 times greater. According to statistics compiled on more than 20 key reservoirs throughout the nation, within less than 20 years, silting has reduced the reservoir capacity by 18.6 percent. Therefore, the Sanmenxia Reservoir on the Huang He, built during the 1950s and to generate electric power at a low load of 20 percent. Some small hydroelectric power stations frequently can only generate electricity when raining and the annual utilization is less than 1,500 hours.

The misuse of biological material energy has also caused the fertility of the soil to deteriorate. According to estimates of the present rural situation, each year, throughout the nation, 378 million tons of stalks are burned, and 230 million tons of organic matter, 1.8 million tons of nitrogen, 450,000 tons of phosphorus, and 2 million tons of potassium are lost. At the beginning of liberation, the application of one ton of nitrogen fertilizer could increase the output of grain by 4 tons, but now, the increased output is only 0.7 tons, and in some areas, no increased output is produced. The nation actually lacks phosphorous and potassium fertilizers; therefore, the loss created is even more difficult to make up.

In summary, the indiscriminate use of biological material energy has created serious consequences for agricultural production and the natural environment. Therefore, rationally developing and utilizing biological material energy is an urgent and pressing task.

In view of the present national conditions, the key to solving the above problems and realize rational development and utilization of biological material energy is to rationally solve the problem of the shortage of energy for domestic use and sideline production by rural farmers. If each peasant family spends 10 yuan to change the open firewood stove into a closed stove, installs an earth bellow, thermal efficiency can be improved onefold and this will ease the shortage of firewood for cooking in rural areas greatly. If a peasant

family spends 50 to 100 yuan to build a methane pit to decompose the combustible content in stalks and night soil, return each nutrients as organic matter, nitrogen, phosphorus and potassium to the farmland, the conflict between fuel and fertilizer will be solved. Because the thermal efficiency of methane is three times higher than directly burning stalks, the remaining stalks can become raw material for developing animal husbandry.

Planting a lot of energy crops in line with local conditions has even more practical significance. We should combine efforts with the implementation of the decree to plant trees, and plant trees for water sources along the upper reaches of the nation's 90,000 reservoirs, and conserve water and soil, in this way, we can maintain the reservoirs and extend the annual number of hours of utilization of hydroelectric stations. Concerned departments of the state can also establish regulations to levy "fees for cultivating forests" on the revenue from the increase in hydroelectricity so that electricity can support forestation and forests can guarantee electricity. Fast growing trees and fuel forests can be planted in front of houses, behind houses, and on road sides. In the south, we can plant eucalyptus, cassava, rose of Sharon, and acacia decurrens. In the north, we can plant poplar, ailanthus altissima, and scholar tree. Water hyacinth can be massively planted in the water areas south of the Chang Jiang, to serve both as feed and as raw material for producing methane. The yield of one hectare of water hyacinth is enough for 40 families to use as methane.

On the basis of broadly planting energy crops, we can also develop industrial and sideline production by processing energy crops. This has special practical significance in the nation's rural villages where the cultivated area is small and there is a surplus of labor. For example, we have always had the tradition of firing charcoal kilns. When charcoal burns, it does not produce smoke, and the thermal efficiency is seven times higher than burning wood. But the traditional method and technology of burning charcoal are backward, the percentage of charcoal production accounts for only 25 percent of the wood raw material, gas that accounts for 25 percent of the raw material and wood tar that accounts for 20 percent of the raw material are wasted and cause environmental pollution. If the earthen kilns can be converted to new types of charcoal kilns, wood tar and methanol and other chemical products can be recovered and combustible gases can be reused for burning charcoal and for domestic use.

The above measures can produce many results in solving the energy problem in rural villages, in protecting the environment, in expanding agricultural sideline production, and in distributing surplus labor. The problem of funds can be solved by solicitation from farmers or by including the projects in commune and brigade plans, by pooling resources and joint management. The State only needs to provide technical guidance, and aid for equipment, materials and economic policy, then prosperous "energy farms" will be able to develop in numbers.

9296

CSO: 5000/4132

GANSU AND QINGHAI TAKE JOINT MEASURES TO STOP THE DESTRUCTION OF FORESTS

Beijing RENMIN RIBAO in Chinese 7 Jul 83 p 2

/Article by Zhang Shusheng /1728 6615 5110/ and Zhou Kuohua /0719 0948 5478/:
"Xishuangbanna' in the Qinghai Plateau Is Seriously Damaged"

/Text/ The Provinces of Gansu and Qinghai have adopted urgent measures to protect the Mengda Nature Reserve which is known as "Xishuangbanna" in the Qinghai Plateau.

The Mengda Nature Reserve which is located in the Xunhua Salar Autonomous County is a contiguous zone between the loess plateau and the Qinghai-Xizang Plateau. The forest area in this region is 143,000 mu and wild animal and plant resources are abundant. According to an investigation by concerned departments, there are 90 families and 509 species of plants and 18 families and 35 species of animals, so people call it the "Xishuangbanna" of the Qinghai Plateau. The region not only has important scientific research and economic value, but also plays an important role in water source preservation and water and soil conservation. In 1980, the people's government of Qinghai Province decided to set up a nature reserve there. However, members of some communes and brigades on the contiguous zone of neighboring Gansu Province continued to fell the forests, even damaging forest production installations, and beating guards; some burned wood on the spot, causing forest fires. Because the administrative organs of the nature reserve were not strong and the management was not strict, secret felling by a few occurred repeatedly. According to investigations, 27,000 mu of forest area have been destroyed and 55,000 cubic meters of timber have been destroyed. Eleven thousand six hundred mu of forests near the Daihejia commune in Jishishan Bonan-Dongxiang-Salar Autonomous County, Gansu Province have been felled. Beginning last year, destruction had spread to the central zone of the nature reserve.

The grave destruction of the Mengda Nature Reserve has now drawn serious attention from the provinces of Gansu and Qinghai. Recently, these two provinces sent representatives to discuss the issue of indiscriminate felling, three points of agreement have been reached: The first is to educate and organize the masses to establish and perfect the basic organizations of forest protection; the second is seriously investigate and deal with cases of forest destruction; the third is to resolutely shut down forever timber markets that have been closed, and to strictly guard against timber trades in disguised forms and in the black markets. At the same time, Qinghai Province has formulated its own regulations on forest management in order to strengthen closing hillsides to facilitate afforestation.

NEW INCENTIVES BRING BETTER RESULTS TO AFFORESTATION EFFORTS IN SICHUAN

Chengdu SICHUAN RIBAO in Chinese 27 Apr 83 p 2

[Article: An Unprecedented Good Situation in This Spring's Afforestation"]

[Excerpts] Large-scale spring afforestation activities in Sichuan ended during the first 10 days of April. At present, each locality is concentrating on sapling cultivation, organizing inspection and managing newly planted trees. According to incomplete statistics of related departments, more than 24.6 million people throughout the province participated in voluntary afforestation; 134,400 mu were afforested and 214 million trees were planted, an increase of 76.3 percent and 14.5 percent respectively over the same period last year. According to the number of people who volunteered (not including deductions for the corresponding amount of labor), each person planted an average of 4.5 trees. This spring, about 1.9 million mu were afforested throughout the province, an increase of 21.87 percent over the same period last year, and 67.1 percent of this year's artificial afforestation plan were completed. More than 800 million trees were planted along the "four sides," and 80.1 percent of the year's plan were completed. More than 110,000 mu were planted with newly sown seedlings, nearly one-half of the year's plan. Progress has been faster than in all previous years.

This year, afforestation has been successful mainly because each locality suited measures to local conditions, implemented effective measures, emphasized practical results from the beginning, emphasized hard work and devoted time and energy to the task. In voluntary planting of trees, while emphasizing the greening of cities, each locality also paid attention to rural areas, actively organized the armed forces and civilians in towns to green unclaimed mountains, organized farmers in rural plains to go to the mountains to plant trees, and implemented the responsibility system of "four assignments and four guarantees" of assigning the task, the area, the quality and the responsibility, and guaranteeing planting, guaranteeing that the plants live, guaranteeing management and guaranteeing that the trees become forests. This broadened the scope of voluntary planting and the work was more concrete. In afforestation of rural areas, many localities relaxed policy, unclaimed mountains suitable for collective afforestation were zoned for commune members as private mountain plots and mountain plots under the responsibility of commune

members. Specialized households in charge of afforestation and cultivation of saplings increased, the responsibility system of linking output to contract responsibility was carried out, and the enthusiasm of the broad number of commune members and masses for afforestation was mobilized. Each locality implemented the responsibility system of "two households" contracting to cultivate saplings, cadres leading the work to cultivate saplings, the responsibility system of assigning cadres and technicians to cultivate saplings, and implemented the method of linking the task of cultivating saplings with wages and awards, and realized better results.

9296

CSO: 5000/4166

TWELVE POINT PROVINCIAL AFFORESTATION PROGRAM PROPOSED

Shijiazhuang HEBEI RIBAO in Chinese 17 Mar 83 pp 1,3

[Article: "Liberalize Forestry Policies to Hasten Greening of Taihang Mountain. Yang Zejiang [2799 3419 3068] Proposes 12 Point Program at Provincial Conference on the All-People's Voluntary Tree Planting"]

[Text] Provincial CPC Committee Deputy Secretary Yang Zejiang proposed 12 points for the rapid greening of Taihang Mountain at the recently held Provincial Conference on the All-People's Voluntary Tree Planting.

1. A combination of farming, forestry, and animal husbandry should be carried out in the Taihang Mountain region, with development of economic diversification for gradual realization of an agricultural economic structure in which forestry is dominant. Attention should be given to afforestation and the growing of grass for improvement in the vegetation cover as a key link in building a rational ecological system. This is the key to bringing the Taihang Mountains under control.

2. In the building of ground cover and development of forestry, a combination of measures including "closing off areas, growing seedlings, afforestation, care of saplings, timbering, and use must be carried out together with the growing of grass, control of waters, and development of animal husbandry. Steps taken should be based on conditions in the forested area, with an adaptation of general methods to local conditions. The suggestions of some experts that barren mountains might be comprehensively developed by growing "grass, bushes, and shrubs" sequentially deserves study. In some places grass may be grown first with afforestation being done later, the grass paving the way for the forests, the grass opening possibilities for animal husbandry, and the grass protecting the forests, holding the soil against erosion, fertilizing the soil, and supporting livestock. In some places mountains can be closed off while saplings are being grown, with tending and afforestation being done later. In some places most important is use of numerous kinds of intensive

techniques for artificial afforestation as the only way in which to hasten the pace of afforestation. In other places strict attention should be given to withdrawing from cultivation for reversion to forests, to grasslands, or to animal husbandry of mountain slopes with a more than 25 degree grade, and to vigorously carry out soil conservation. In growing grass, a combination of both artificial growing of grass and the protection and improvement of grasslands should be done. Efforts should be directed to the growing of sweet clover, alfalfa, shadawang [3097 2092 2489], kudzu vine, false indigo, and such fine grass varieties.

3. Strict zoning, planning, and designing. A survey of natural agricultural resources done in combination with zoning for agriculture, forestry, and animal husbandry. Planning and design of forestry should be done for individual villages, individual mountains, and each and every ravine. Conflicts between use for forestry and animal husbandry should be correctly handled, and overall planning done for kinds of forests wanted (fruit tree, mulberry, timber, firewood, soil conservation, shoreline protection, or watershed forests), kinds of trees, afforestation and growing of grass, growing of saplings, transplanting, tending, and effectiveness. Once the masses have approved diagrams, realization of plans should be worked on for a long period of time.

In the foothills and hill regions of the Taihang Mountains, and inside and outside the Great Wall in the Yanshan mountain range, priority should go to development of juicy fruits and dry fruits [such as nuts]. The right trees for the soil should be selected, and all sorts of fruits should be developed, with plans made for fruit storage and transportation. Modern processing methods should be given particular attention. Places suitable for the development of juicy and dry fruits, silkworm mulberry, and economic forests should plan the growing of additional tree varieties. Overall planting that takes all factors into account, equitable distribution, and fully rational use of resources should be done in the case of shelter forests and firewood forests.

4. Painstaking organization of voluntary tree planting. In view of the size of the Taihang Mountain region, results should be greater and better than on the plain.

5. Further liberalization of forestry policies requires reliance on individuals, collectives, and the state working together in afforestation. Numerous places should use mostly afforestation by individual families. For this reason, emphasis will be given this year to the implementation of various forms of contract responsibility systems linked to output to raise peasant enthusiasm for

afforestation in the same way as for a year's growing of grain and oil-bearing crops, and for a gradual shift in peasant workforces into controlling the mountains, afforestation, and growing grass. Standards for judging correctness of actions should be "whether or not they help build a Chinese style socialism, whether or not they help the nation prosper, and whether or not they help the people become rich and happy." Thinking should be further emancipated and policies liberalized. Where privately retained mountains have not been divided up sufficiently, and particularly in places where no division has been done at all, division should be resolutely carried out, and an overdivision by 20 or 30 percent done. Responsibility mountains for individual households should be quickly apportioned to individual households and agreements signed. Forces should be concentrated for earliest completion of "three fixes" work on forest rights. Everyone should devote special attention to places having a fair number of barren mountains and to regions deep in the mountains for development of specialized households cooperative economies of various kinds to contract afforestation. Specialized households may contract several hundred or 1,000 mu of mountains or a ravine and a mountain. Contracting may be done for a single or for several forest product cycles such as no change for a period of 50 years with rights of inheritance by children and grandchildren. Peasants should be encouraged to move deep into the mountains to live, grain rations being provided them by the collective or by the state. They may exchange labor with other peasants and have ownership of any trees or fruit trees they plant. Forestry should be paramount with development of economic diversification, the balancing of strengths and weaknesses, and all income from economic diversification belonging to those who produce it. The collective or the state may provide fund subsidies, seeds, and saplings. When the trees mature, contracting households will receive the largest portion of them, etc. Contracting requires signing of agreements and conformity to centralized planning on tree varieties, with fulfillment of agreements within the stipulated time. When the time passes without fulfillment, penalties should be applied. All jurisdictions should summarize, exchange, and promote experiences in this regard, and give a free hand to development of specialized households and priority households in forestry.

6. Gathering of seeds and growing of seedlings should come first. Commune members should themselves carry out seedling reproduction, and gather and tend local seeds and seedlings. Specialized households and priority households for the raising of seedlings should be developed, and commodity exchange of seedlings should be encouraged. New techniques for growing seedlings should be spread. The state, nurseries, communes and brigades, industrial plants, official organizations, and schools should

designate land for the growing of seedlings, which should be of many kinds and of high quality. County and commune demonstration seedling nurseries, fruit tree and mulberry seedling nurseries, and grass seed farms should be established. Mountain regions should be zoned as to tree varieties and areas that may be directly afforested or sown by air. Techniques for direct sowing should be improved, and experiences in aerial sowing summarized. Forestry seed companies (or stations) should be run well, and attention given to forestry breeding work in order to provide the entire province with superior varieties of tree seeds.

7. Control of small basins in mountain areas should be taken firmly in hand. There should be a combination of biological measures and engineering measures for the building of farming, forestry, and animal husbandry, with forest and grass cover being paramount. There should be planned ravine by ravine and mountain by mountain control, and a solid job done over a long period of time. County and commune leaders in mountain regions should make a division of labor as Jingtai County did for the contracting of mountain ravines and the contracting of mountain tops.

8. Need for attention to science and technology. It is suggested that leaders at all levels learn something about forest tree and fruit tree science such as forestry fruit tree culture. Demonstration counties and townships should be set up. Efforts should be made to complete scientific experiment tasks. Modern science and technology should be applied to forestry in an effort to develop modern forestry. More emphasis should be given to man-made afforestation of the Taihang Mountain region, and to intensive techniques of tending it. Forestry technical personnel should carry out technical contracting linked to output with peasants. They should promote modern forestry skills to insure improvement in the survival rate. The conservation rate should be about 80 percent. Mountain regions should operate more agricultural middle schools in which forestry is foremost for the local training of people versed in forestry, animal husbandry, and farming. All institutions of higher education should give attention to various methods of enrolling more students from mountain regions. They should further implement policies for mountain region intellectuals. Advertisements should be placed for the recruitment of technical personnel from cities and the plains to go into the mountains.

9. State forest farms should conscientiously institute contract responsibility systems linked to output that are suited to the needs of forest farms to serve as models. They should help communes and brigades improve skills through institution of technical contracting. Commune and brigade forest farms should insti-

tute diverse forms of contract responsibility systems linked to output. Forest farms should engage in diverse operations such as afforestation a combination of forest and fruit trees, a combination of forestry and animal husbandry, and integrated forest, industrial, and commercial development. They should balance strengths and weaknesses for steady, solid development.

10. In addition to guaranteeing rational use of national funds in meeting forestry expenses, multiple forms of self-reliance should be adopted to solve problems. Provinces, municipalities, counties, and all departments, industries and trades directly or indirectly involved in the building of mountain regions should gradually increase investment and loans for the building of the Taihang Mountains and mountain regions. They should overcome an attitude of slighting the building of forests in mountain regions. It is suggested that county and commune representative assemblies should decide that commune members should pay a certain amount of funds for afforestation, which would be used collectively by communes and brigades. A certain proportion of profits from commune and brigade collective industrial sideline industries should be taken out for use as an afforestation fund. Forest farms, orchards, and forestry enterprises should use forests to nurture forests. Except for bonuses and welfare funds, profits should be used primarily for development of forest tree and fruit production. Use of funds need not throw ownership rights into turmoil. Certain assistance can be provided on the basis of afforestation results and results in the growing of seedlings to encourage more afforestation and good afforestation.

11. Forests should be governed according to law, and violations of the law must be prosecuted. Destruction of trees must be strictly prohibited and policies for the protection of forests conscientiously implements. The "Forestry Law" and "Regulations on Water and Soil Conservation" should be further carried into effect. Also necessary is a study of laws that the province should enact for bringing the Taihang Mountains under permanent control.

12. Launching of a competition for the greening of the Taihang Mountains, with the province and counties once annually convening a conference to hand out commendations for the greening of the Taihang Mountains.

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CSO:5000/4150

GANSU'S SPECIAL NEED FOR AFFORESTATION STRESSED

Lanzhou GANSU RIBAO in Chinese 12 Mar 83 p 1

[Article: "Need to Seek Substantial Results From Afforestation"]

[Text] As an accompaniment to the genial spring winds, the annual tree planting season has arrived again.

For Gansu Province, afforestation holds special significance. Most parts of the province are arid and disaster-prone. One of the main reasons for serious soil erosion and the hard life of the masses is a low vegetation cover rate and imbalance in the ecological environment. For this reason unless forestry is developed, any change in Gansu Province's circumstances is hopeless and doomed to failure. Everyone should realize the seriousness of this problem and should steadily raise their consciousness of the planting of trees for afforestation, making the work of afforestation a long term strategic task to be taken in hand urgently, well, and firmly.

The key to doing a good job of afforestation lies in maintaining quality and improving the survival rate. If attention is given only to planting but not to survival, what use is there in planting? Last year was the year of greatest accomplishments in afforestation in Gansu Province since founding of the People's Republic more than 30 years ago, yet quite a few problems also exist. A survey done in 18 arid counties in the central part of the province shows a survival rate in afforestation last year of only about 40 percent. In quite a few other places, afforestation work amounts to "a spring upsurge, gnawing by sheep in summer, and use for firewood in winter." Year after year afforestation is done without any forests resulting. Investment is large, but benefits are small. This problem should arouse concern and serious attention. All jurisdictions should use a summarization of last year's experiences in afforestation as a basis for learning past lessons of experiences, for studying solutions to new problems, and place the issue of quality in first place from the very outset.

The experiences of numerous places has demonstrated that in order to assure quality in afforestation, it is necessary to institute responsibility systems decisively. In rural areas, it is necessary first to clarify rights of use of mountain forests, and then to rule that the forests belong to those who do the afforestation, and that a right of inheritance exists for those who have done afforestation as individuals. Without impairing development of animal husbandry, the "three wastelands," should be entirely zoned for tending by commune members as individuals, zoning done of whatever amount is available, and a time limit set for the planting of trees and the growing of grass, with clearing of land for agriculture strictly prohibited. It is necessary to get going on vigorous promoting of household contract responsibility systems for forestry, and actively support specialized households and priority households for afforestation and the growing of saplings. State and collectively owned forest farms should resolutely smash "large common pots" and actively promote contract responsibility systems. The greening of cities and towns must also be done on the basis of actual circumstances, with various kinds of responsibility systems for the contracting of sole responsibility for individual tracts instituted, and rights, responsibilities, and benefits correlated. At the same time, in the course of planting trees for afforestation, it is necessary to formulate plans and pay careful attention to scientific methods. Tree varieties should be selected on the principle of the right tree for the right place, and saplings should be grown in a solid quest for substantial results. Only by persevering in this way can the quality of afforestation be greatly uplifted.

Right now is the best time for planting of trees and afforestation. Leaders at all levels should rally their spirits, improve their workstyles, strengthen leadership, and lead the broad masses to take rapid action in fulfilling and overfulfilling this years voluntary tree planting and afforestation tasks, maintaining both quantity and quality, to make a new contribution in changing Gansu's aridity as quickly as possible and making new achievements!

9432

CSO: 5000/4150

EMPHASIZING THE ADVANTAGES OF THE CONTRACT SYSTEM

Beijing RENMIN RIBAO in Chinese 10 Mar 83 p 2

[Article: "Reform Is Also Called for in Tree Planting Activities"]

[Text] With the warm breezes of spring, tree planting movements begin.

Many people are worried, every year trees are planted but there is not a tree in sight, after planting and planting there is barren land. This type of worry makes sense. Because for many years some places only emphasized planting and ignored management; as if once trees were planted, they would naturally grow. The following has been a common scene: The small trees on the side of the road develop new buds, the trees are tall and erect and dance in the breeze. It does not take very long, however, before pigs, cows and sheep start to eat the trees. Sometimes only bare stumps are left in the ground; sometimes they are pulled up roots and all. This manner of pursuing lifeless numbers without strengthening management, wastes a great deal of manpower, materials, and money and nothing is gained.

Evidently afforestation work needs to be reformed. If afforestation is to be implemented, the leadership should do it in the proper way, the method should be practical, the regulations should be complete, and follow-up measures should be carried out. This will require the coordination of several aspects: 1) Coordinating long-term plans with the work of the current year: From the province, prefecture and county to the commune brigades and various business units, all should have 10-year or 20-year plans and the tree planting and afforestation work of the current year should be arranged on the basis of these plans. 2) The departments in charge should coordinate with various organizations so that there will be persons engaged in afforestation work everywhere and at all times, and see it through. 3) The state, the collective, and the individual should unite so that the trees planted by the state belong to the state, the trees planted by the collective belong to the collective, and trees planted by individuals belong to the individuals. The ownership of trees should be clearly defined to encourage all positive factors. 4) Awards and penalties should be coordinated. Collectives and individuals that make notable achievements in afforestation should be highly praised and awarded; those who destroy afforestation should be criticized, educated and punished promptly.

Planting without management will not accomplish the goal of afforestation. We must not again pursue formalism by simply trying to plant a certain number of trees. We must emphasize how many trees survive and the amount of acreage afforested. Working in this way for 5, 10 and 20 years, the fatherland will be covered with shady trees.

6248

CSO: 5000/4143

RELATIONSHIPS OF ECOLOGICAL ENVIRONMENT, ECONOMIC DIVERSIFICATION

Kunming YUNNAN RIBAO in Chinese 11 Mar 83 p 2

[Text] Within the borders of the Nujiang Lisu Autonomous Prefecture lies the Dulong Jiang, Nu Jiang, Lancang Jiang, Tanlaka Shan, Gaoligong Shan, and Biluoxue Shan, with thousands of peaks and tens of thousands of ravines, steep slopes and deep valleys, the factors limiting the development of agricultural production. This type of region has great potential, however. If attention is given to maintaining the ecological balance and developing diversification, a new situation for agriculture in the entire prefecture remains possible.

Forests are the principal parts for maintaining the natural ecological balance and promoting the benign cycle of agricultural ecology. The Nu Jiang has always been famous for "wall cultivation." According to a survey of the dry lands of one commune, 5.9 percent of them have a grade above 15°; 62.4 percent 15-30°; and 31.7 percent above 30°. In this type of area, burning forests for reclamation should never be done again. Strong measures should be adopted to prevent forest fires. Some precipitous slopes should be retired from farming and reforested. Waterpower resources should be fully utilized to develop small hydroelectric stations to resolve the problem of energy supply in rural villages and reduce the consumption of firewood. The old-fashioned domestic dwellings that require a great deal of timber should be changed and new dwellings that consume less timber should be expanded.

The altitude difference in the Nujiang Daxia Valley is more than 4,400 meters, to gather a vertical climate from the north Tropical Zone to the Frigid Zone in one valley. From the valley floor to half way up the mountain at 2,000 m, the climate is mild, the rainfall abundant, and the natural fertility of the soil is high. There are many species of economic trees and they grow luxuriantly. There is a great potential for developing forestry, animal husbandry, and medicinal plants. For example, in 1980 there were more than 31,000 mu of tung trees in the prefecture; in the past 2 years, more than 48,000 mu have been added. By the end of this century, 200,000 mu will be ready for harvest and the value of the fruits will be increased from the 700,000 yuan of 1980 to 14 million yuan, a growth of 20-fold. If paint factories are set up for reprocessing, the output will be even higher. The development of economic trees will promote the ecological balance. This is a golden opportunity for the border

regions to become rich. The resources of wild medicinal plants are also extraordinarily rich and some areas are good for the artificial cultivation of some famous drugs. The high altitude frigid forest zone below the snow line and above the land suitable for agricultural crops is also suitable for cultivation. *Coptis chinensis* grows well under the shade of the forest trees. It does not compete with agricultural crops for land and is favorable for water and soil conservation.

Transportation is the important factor limiting production and circulation of products in the border areas. In Nujiang, there is only 4.8 km of highway per km² of area, the lowest in the province. At present, 20.6 percent of the area's communes are not linked by highways and 5.2 percent of the brigades have no post roads. Within the prefecture, 66 percent of the bridges on both banks of the three rivers are slide cables. These conditions are obviously unfavorable for further flourishing of the rural economy. The ropeways should be changed to drawbridges as soon as possible. Communes and brigades that have no highways or post roads should construct them in stages as soon as possible. Markets should also be established at crossroads to promote the circulation of goods between the cities and the countryside.

Scientific and technological teams of the border areas should be stabilized and strengthened. Intermediate grade scientists and technicians are in short supply for the agricultural and forestry battlefronts in this region. The production policy for the prefecture is "taking forestry as the key" but up to now there are no forestry engineers and specialists to direct such segments as drug production, agriculture, animal husbandry, water, or gas and there are very few middle-aged science and technology personnel. There are no intermediate scientists and technicians from the local nationality. Therefore, necessary measures should be adopted to put the available scientific and technological teams to full use and at the same time the various bureaus and departments of the province should also establish agencies to direct scientific and technological work in the border areas. It is hoped that a specific target will be given to Nujiang in terms of student admission at all the universities, colleges, and special schools to select and admit those who qualify. Advanced study classes should also be established for current scientific and technological cadres and special attention should be given to the cultivation of scientific and technological cadres of the local nationality.

6248

CSO: 5000/4156

ADOPT BIOLOGICAL MEASURES TO CONSERVE WATER SOURCES, PROTECT RESERVOIRS

Beijing RENMIN RIBAO in Chinese 3 Feb 83 p 2

[Article by Zheng Qimin [6774 0796 3046]: "An Urgent Problem During Construction in the Luan He Valley"]

[Excerpts] Premier Zhao Ziyang has said: "The construction of the Panjiakou Reservoir and Daheiting Reservoir in Hebei, and the project to divert water from the Luan He to Tianjin will alleviate the water shortage for industrial and agricultural uses in the region of Beijing and Tianjin." This is an economical way of fundamentally resolving the long-term water shortage problem in Tianjin.

The Luan He is the second largest river in North China, with a trunk measuring more than 880 kilometers in length and a mean annual runoff of 4.6 billion cubic meters. The water quality is good and it is one of the better water resources in the region of Beijing and Tianjin. The principle structures of the two large reservoirs along the lower reaches of the Luan He have been completed and are storing water. The total capacity is 3.3 billion cubic meters. At present, the project to convey water to Tianjin City is under construction and it is expected to be operational before the National Holiday this year. When that happens, 1 billion cubic meters of water will enter Tianjin City every year and the problem of water for industrial and domestic use will be preliminarily resolved. The water of the Miyun Reservoir will supply Beijing only. The severe water shortage in the Beijing and Tianjin area will be alleviated.

For the inhabitants of Beijing and Tianjin, this is good news. However, problems remain.

The valley in the upper reaches of the Panjiakou and Daheiting Reservoirs has an area of 35,700 km². Large-scale logging during the latter years of the Qing Dynasty destroyed the vegetation cover severely and water and soil erosion is serious. After Liberation, afforestation was encouraged, trees and vegetation returned, but, nearly half of the area is still barren mountains to this day, mud and sand threaten the reservoirs.

The Panjiakou and Daheiting Reservoirs are located in an area where three major tributaries of the lower reaches of the Luan He--the Bao He, Liu He and Sa He converge. This is an area of pine mountains and precipitous slopes, water and soil erosion is very serious. According to statistics, on the average, more than 18 million cubic meters of rock and mud flow every year, and has reached a high of 70 million cubic meters.

This is a new and pressing problem that Tianjin must face. The state has appropriated 16.5 billion yuan to construct the Panjiakou and Daheiting Reservoirs and the project to divert water to Tianjin. But, can these water conservancy projects fully develop their economic benefits? Can the water of the Luan He flow continuously into Tianjin (for example, 50 years)? Aside from extraordinarily dry years, to a large extent it depends on whether attention is given to the work of restoring the vegetation cover of the Luan He Valley and whether the work is effective. Hu Yaobang once said: "To build a forest is to create water." Afforestation in the upper reaches of the Panjiakou and Daheiting Reservoirs will not only prevent water and soil erosion but also will increase the sources of water for the reservoirs. Hebei Province must consider and make arrangements for the work on vegetation cover of the Luan He Valley as soon as possible. Tianjin and Beijing should also actively participate and give it vigorous support.

6248

CSO: 5000/4139

AFFORESTATION ENCOURAGED IN POOR AREAS TO INCREASE AGRICULTURE OUTPUT

Chengdu SICHUAN RIBAO in Chinese 21 Jan 83 p 2

[Article by Shi Yizhi [0670 5030 1807], Deputy Secretary of the Communist Party Committee of Ebian County: "Large Mountain Regions Must Insist on Emphasizing Afforestation before there Is Hope"]

[Text] Ebian County situated in the Xiaoliang Shan region has a total area of 3.59 million mu. The cultivated area accounts for only 5 percent; forest land covers 2.17 million mu, accounting for 60.4 percent of the total area. The main species of trees are fir, dragon spruce, and Chinese hemlock, followed by Chinese chestnut. In the past, the forest cover rate was 37.6 percent. The timber reserves were 32 million cubic meters. In the rural areas, the per capita average of forest land is 21 mu and 320 cubic meters of timber. Such rich natural resources are the material foundations for enriching the mountain regions and making the economy prosperous. But, for a long time, under the mistaken "leftist" influence, "take grain as the key link", the area of cultivated land was expanded without limit, a large amount of materialized labor and living labor were consumed, forests were destroyed for reclamation, and in some years, reclamation took up 20,000 to 30,000 mu, forest resources and the ecological balance were destroyed. Even so, the average per capita ration of grain throughout the county was only 500 jin and the distributed income was less than 60 yuan. How this situation can be changed is an important task facing us.

After the Third Plenum of the Party's 11th Congress, we began to break away from the "leftist" confinement, conscientiously implemented the series of policies of the Central Committee and the provincial committee, and hastened progress in economic buildup; there emerged a group of models that were adapted to local conditions and developed regional advantages to eliminate poverty and become rich. The Ye'nanxi Production Team of the Dabao Commune at an elevation of 1,400 meters above sea level had 2,500 mu of barren mountain land suitable for afforestation and 112 mu of cultivated land. Since 1980, they insisted on giving priority to afforestation, combined agriculture and livestock production, and in 2 years, each laborer afforested an average of 31 mu, and the survival rate was 90 percent. The number of horses, cattle, sheep and other domestic animals grew. Because the forests were not destroyed for reclamation, seeds were not widely planted with less harvest, and intensive cultivation was implemented, grain production visibly increased. Lewu Commune is located in a virgin forest abundant with precious fir and dragon spruce. The total area of the commune is

620,000 mu, of which 380,000 mu is virgin forest, accounting for 61.3 percent. The reserve is about 11 million cubic meters. In September, 1980, this commune began to establish joint enterprises in forestry, industry and commerce. Revenue from forest and wood products increased, and this provided funds for developing forestry, agriculture and animal husbandry. In 2 years, 50 mu of fir saplings were planted and 2,580 mu of land was afforested. In 1981, income from forestry amounted to 321,100 yuan, and the per capita average income of the whole commune was 121 yuan. Grain also increased 11.4 percent over that in 1980. The per capita average savings of the whole commune was 59 yuan. Commune members of 609 households bought 320 watches, 220 radios, and 185 households built new houses. We realize from the above model cases that Ebian must give priority to afforestation, combine agriculture and livestock production, implement overall development, and gradually follow the road of joining forestry, industry and commerce. After the practice of the last two years, the situation in the county changed greatly. First, forestry developed greatly. Since 1981, the whole county has planted and cultivated 909 mu of saplings, and afforested 33,200 mu of land. The cultivation of seedlings, afforestation, quantity and quality were all unprecedented. Second, the structure of the agricultural economy began to change towards a rational direction. The proportion of diversification and industrial and sideline industries as a percentage of the total agricultural output gradually rose year after year. Third, the area of cultivated land was fixed. Destruction of forests for reclamation was stopped and intensive cultivation was promoted. Grain production increased year after year. Last year, they realized an increase of over 10 percent. Fourth, three joint enterprises of forestry, industry and commerce were established, providing new experience for using grain to guarantee forestry, using forestry to stimulate grain production, using forestry to lead diversification, and enliven the economy.

According to the requirements of natural laws and objective economic laws, we plan to build Ebian county into a county mainly engaged in forestry by the end of this century. The total industrial and agricultural output should be quadrupled on the basis of that of 1981, i.e., reaching 120 million yuan and a per capita average of 1,000 yuan. To realize this strategic goal, we must continue to eradicate the past influence of only emphasizing grain in our guiding ideology, and we must not relax grain production. We must insist on giving priority to afforestation, and follow the road of establishing joint ventures in forestry, industry and commerce. Ebian is a large mountain region, the topography is complex, weather conditions are poor. There are many disasters, and the development of grain production is greatly limited. But, at places suitable for planting grain, we must pay attention to grain production, use grain to guarantee forestry and use grain to stimulate forestry. At present, we must stabilize the area of cultivated land, strictly prohibit the destruction of forests to plant grain, build up farmland well, apply advanced technology and achievements in scientific research, improve unit yield, increase total output, and gradually return cultivated land for afforestation under the prerequisite that grain is basically self-sufficient. In the development of resources, we must shift the emphasis on the current year's revenue to simultaneously engaging in long-range buildup. We cannot just consider the present and neglect the future and the ecological balance. We must continue to implement the "Forestry Law", insist on taking afforestation as the foundation, and plant more than we fell. The March bamboo of Ebian grows with broadleaf forests, they are interdependent and interact. When they are out of proportion, the ecological balance is affected.

To continue economic reproduction and natural reproduction, we must establish laws, close hillsides and implement rotational felling, reduce processing of bamboo shoots as much as possible, greatly develop commercial products with foreign capital, such as salted bamboo shoots and canned bamboo shoots in water. In organizing production, we must shift from decentralized management to division of labor by specialization, and follow the road of joint ventures. At present, some production teams and commune members have voluntarily joined together to establish forest farms, tea plantations, herb farms, mulberry gardens, and fruit gardens. Their experience in jointly operating gardens and farms and joint ventures in forestry, industry and commerce must be conscientiously summarized and popularized so that they can be strengthened and developed. In the future, we must also develop joint ventures among communes, among counties and communes and between regions, use foreign capital, equipment and technical strength, develop mountain resources, and carry out comprehensive utilization well. In the production of commercial products, we must promote the buildup of bases for diversification. We must proceed from actual conditions, draw up unified plans, proceed from the entire area to individual sites, from the easy to the difficult. In the arrangement of capital, we must support key projects, build one and reap the fruits. In addition, we must also promote scientific research and the popularization of science and technology so that science and technology can truly become the great force to move forward the buildup of forestry and economic development.

9296

CSO: 5000/4136

ALTERNATE USES OF ENERGY PROMOTED

Chengdu SICHUAN RIBAO in Chinese 18 Jan 83 p 3

[Article by Guo Xiangshi [6753 0686 4258]: "The Three Prefectures Should Gradually Popularize the Use of Electricity as a Substitute for Firewood"]

[Text] Aba, Liangshan, and Ganzi Autonomous Prefectures have large areas of forests. For many years, because of excessive felling forest resources have been greatly destroyed. In particular, a lot of wood has been felled in the forest regions for firewood, timber that could be used for construction has been burned. This is an even greater waste. Because the forests of the three prefectures nurture the sources of the Chang Jiang and serve to maintain the ecological balance in the Sichuan Basin, the problem of protecting forest resources in the three prefectures has become a common concern. The planned popularization of electricity as a substitute for firewood in the forest regions of the three prefectures and the use of electricity for cooking, boiling water and heating can conserve timber and protect forest resources, stimulate economic development and raise the living standards. This issue is worth our attention.

The three prefectures are rich in hydroelectric resources. In recent years, small hydropower construction has been relatively fast. At the end of 1982, the total installed capacity of small-scale hydropower stations in Liangshan Prefecture had reached more than 60,000 kilowatts. Most counties have built small-scale backbone hydropower stations. Aba and Ganzi Prefectures also have built many small-scale hydropower stations. But because the industrial foundation in the three prefectures is weak and for other reasons, many of the current small-scale hydropower stations cannot be fully developed. The rate of utilization of the facilities of some power stations is low, and there is a serious problem of unused electricity. There are conditions to use surplus electricity for cooking and heating. Some of the localities in the three prefectures have installed electric stoves, and have achieved good results by using electricity as a substitute for firewood.

According to our understanding, there are 800 households using electric stoves in Puge County, Liangshan Prefecture. Each household can conserve an average annual amount of firewood equivalent to 1.4 cubic meters of logs, and each year 1,120 meters of timber can be saved. Zhaojue County not only installed over 1,100 electric stoves in recent years, it also installed electric boilers at schools, factories, and mines to provide heat and steam. This solved the long-standing problem of having a shortage of boiling water and hot water supply

at these units. This also prompted the hydropower stations (plants) to improve business management, to generate and supply more electricity and increased revenue.

To popularize the use of electricity as a substitute for firewood according to plan in the three prefectures, it is suggested that concerned sectors help the three prefectures carry out overall planning, do the work at test points well, summarize experience, and gradually popularize it. There is a lot of land and few people. Residents are scattered.

The near-term plans for using electricity as a substitute for firewood should mainly be carried out in the county cities and towns, and at forestry departments where the population is concentrated. The surplus electricity of existing power stations should be utilized. The key point of the plan should be to fully develop the potential of existing power stations. Under the prerequisite of good planning, and rational distribution, new power stations should be constructed step by step in a planned way and in accordance to one's capability in areas that lack electricity and need new power stations. The power distribution lines of the network for using electricity to replace firewood should be considered in combination with the composition of the consumption loads specified by the plans. At the same time, we must not only consider the use of electric stoves for each household, based on the experience in Zhaojue County, factories, schools and other large units in county towns and prefectures that burn a lot of firewood and coal should develop electric heating and pressurized electric boilers, and use central heating and air feeds. It is also hoped that concerned departments can study and produce electric boilers.

How to calculate the price of electricity to replace firewood is a problem that should be studied well. The price of electricity must not be high, otherwise consumers will not be willing to use it, but the power stations must not operate at a loss. Power stations should improve business management, generate more electricity, and reduce the cost. At the same time, it is worth studying whether concerned sectors should provide some incentives, in taxes and in profits submitted to the higher authorities, for power stations that popularize the use of electricity to replace firewood.

9296

CSO: 5000/4136

YUNNAN AFFORESTS MOUNTAINOUS WASTELANDS

OW270904 Beijing XINHUA Domestic Service in Chinese 0146 GMT 27 Aug 83

[Excerpts] Kunming, 27 Aug (XINHUA) -- Considering the full development and rational use of the resources of the waste mountains and the development of economic and timber forests as an important measure to achieve the strategic goal of quadrupling Yunnan's total agricultural output value, Yunnan Province has mobilized tens of thousands of peasant households to afforest waste mountains. Incomplete statistics show that as of mid-August, over 44 million mu of mountainland had been assigned to peasant households as plots for private use or as plots under production-responsibility contracts. Over 3.2 million mu of waste mountainland had been afforested, which is more than 28 percent of the 1983 afforestation plan.

In early May this year, the Yunnan Provincial CPC Committee and People's Government held a meeting of the secretaries of all prefectural, (including autonomous prefectural), and county party committees to review the situation over the past 3 years, in which agricultural output has increased each year. It was pointed out: Mountainous and hilly land accounted for 94 percent of Yunnan's total area and the acreage of waste mountains suitable for afforestation totaled over 100 million mu -- this was Yunnan's wealth. To maintain the beneficial cycle of agricultural ecology in Yunnan and to ensure the realization of the strategic goal of quadrupling Yunnan's total agricultural output value by the end of this century so that the people of all nationalities may become well off as soon as possible, it was imperative to take the viewpoint of large-scale agricultural development and the commodity economy, and make it an extremely important task to develop the resources of waste mountains by planting forests for timber and other commercial purposes. We must go all out to fulfill this task with good results.

Shortly afterwards, more than 80,000 cadres throughout the province were sent to villages and mountains to publicize the party's policy among the peasants of all nationalities and to solicit their opinions. Concrete plans were then formulated to assign mountainous areas to peasants as plots for their private use or under responsibility contracts. This was followed by issuance of certificates of land for private use and the signing of contracts for afforesting mountains and of pacts on the protection of forests.

Statistics covering the 13 prefectures (including autonomous prefectures) show that as of early July, 2.41 million jin of tree seed had been collected. Toward the end of July, the 13 counties in Qujing Prefecture had afforested 678,000 mu of mountain land, 93 percent more than the quota assigned by the provincial authorities; the 1,600 peasant households engaged in fulltime forestry in Yanjin County, on the plateau in northeastern Yunnan, had afforested 42,000 mu of mountainland, 63 percent of the country's already-afforested acreage.

CSO: 4008/220

AFFORESTATION HALTS DESERT EXPANSION IN SHAANXI

OW271112 Beijing XINHUA in English 0726 GMT 27 Aug 83

[Text] Xian, August 27 (XINHUA) -- Trees and grass planted in the past 30 years and more have almost halted the southward spread of Mu Us Desert into Yulin Prefecture in Shaanxi Province, northwest China.

The prefecture was commended at a conference earlier this month on economic development of arid and semiarid areas of north China. The conference called for the planting of more trees and grass to help achieve a balanced development of agriculture, forestry and animal husbandry.

The Mu Us Desert traditionally threatens areas in seven counties, encompassing 16,000 square kilometers. The areas used to be hit by sandstorms on an average of 66 days each year. This had dropped to 16 days a year, officials at the conference said. Afforestation efforts in the past three decades have now reduced sand dune shifting from between three to eight meters a year to about one meter. Only 40,000 hectares were covered by trees before 1949, the year New China was founded. The current figure is 473,000 hectares, the officials reported.

Plans to build three tree belts stretching 950 kilometers have been 82 percent fulfilled, protecting 80,000 hectares of farmland. Shifting sand dunes of 305,000 hectares have been arrested or almost secured by grass and shrubs planted, the official said. The planting has boosted the prefecture's economic development. For the first time peasants have been able to grow rice and wheat over large areas, the officials added.

Last year, the desert-plagued areas' grain output was 145,000 tons, for an average of 311.5 kilograms per capita -- 35 kilograms more than the prefectural norm. The number of draught animals also rose from 76,000 in the early 1950's to 210,000 last year officials said.

CSO: 4010/91

SHANXI URGES AFFORESTATION ON MOUNT TAIHANG

SK080856 Taiyuan SHANXI RIBAO in Chinese 20 Aug 83 p 1

[Excerpts] The provincial Forestry Department recently held a meeting of directors of prefectural and city forestry bureaus and forest management bureaus throughout the province. The participants studied and discussed the important instructions of central leading comrades and conscientiously worked out plans for afforesting Taihang Shan.

During their inspection tour in our province in mid-July, the central leading comrades pointed out that efforts should be made to ascertain the basic situation of Taihang Shan as soon as possible, formulate plans and turn, in 20 years, the "yellow dragon" -- Taihang Shan -- into a "green dragon."

In our province, the Taihang Shan range covers 57 counties and cities, totaling more than 100 million mu -- about 50 percent of the total area of the province. In order to successfully implement the central leading comrades' instruction on afforesting Taihuang Shan, the participants to the provincial meeting of directors of prefectural and city forestry bureaus and forest management bureaus sponsored by the provincial Forestry Department conducted earnest discussions and study and pledged to strive to increase the Taihang Shan's forest-covered area from the present 11 percent to 27 percent by the year 2000 and then to 40 percent gradually.

The meeting also decided to attend to the following four tasks this year: 1) Arouse departments at all levels to give wide publicity to the instruction of the central leading comrades so as to make it known to every family; 2) organize contingents of planning workers promptly to conduct investigations and research, sum up experiences, make appraisals on special topics, and work out effective and feasible plans, which give overall consideration to farming, forestry, animal husbandry, sideline production, and fishery, aim at improving mountains, water areas, farmlands, forests, and roads, rationalize the distribution of high forests, shrub areas, and grasslands, and make organic combination of various varieties of forests and trees, and which proceed from reality, give consideration to strong and weak points, and stress real benefit; 3) vigorously popularize the successful experiences in "three hills" (private hills, responsibility hills, and hills for voluntary afforestation), "two households" (specialized and key households), and "one farm" (household-run small forest farms), rely on thousands of households to develop forestry and combine the efforts of individuals, collectives and the state, and 4) launch a large-scale campaign for collecting tree seeds this autumn so as to lay a solid foundation materially for accelerating the afforestation of the Taihang Shan.

CSO: 4008/220

EROSION IN THE CHANG JIANG BASIN TERMED SERIOUS, CONTROL MEASURES SUGGESTED

Shenyang SHENGTAIXUE ZAZHI [JOURNAL OF ECOLOGY] in Chinese No 2, 1983 pp 30-34

[Article by Li Shiju [2621 0013 5468], Chang Jiang Basin Planning Office:
"Restore the Country's Land To Create Prosperity for the People--On the
Seriousness of Erosion in the Chang Jiang Basin"]

[Text] 1. Foreword

In 1981, with support from the National Agricultural Commission, the Chinese Forestry Society formed a study group made up of workers in water and soil conservation, forestry, water conservancy, soil, geography, and socio-economics to study some major areas of erosion in the Chang Jiang basin.

The Chang Jiang basin has been richly endowed by nature. In the mountains of its upper reaches forestry, water power and mineral wealth abound; and the plains of its middle and lower reaches are the country's major agricultural area. Though the area of the Chang Jiang basin is only one-fifth of the country's total area, and one-fourth the country's cultivated land, it accounts for 40 and 33 percent respectively of the country's grain and cotton output, and occupies a decisive position in the national economy. The problem of water and soil conservation in the Chang Jiang basin is just as Professor Wang Zhan [3769 2069] of the Chinese Academy of Sciences' Institute of Pedology said: "What concerns some scientists in China today is not whether the Chang Jiang will become a 'Huang He,' but that the Chang Jiang not become a 'Huang He'." If the Chang Jiang basin's ecological environment deteriorates to the state of the Huang He today, China will be in danger of perishing!" I believe this warning is scientifically valid and realistic; it should be given serious attention.

2. Present State of Erosion of the Chang Jiang Basin

A survey made in the 1950's showed a 360,000 square kilometer area of erosion in the Chang Jiang basin. This was 20 percent of the basin's area. Seriously eroded areas in which the erosion modulus was 12,000 tons per square kilometer per year covered 180,000 square kilometers, or about one-half of the eroded area. Extrapolation to the annual erosion of 2.4 billion tons of soil amounts to erosion of the soil layer in the eroded area to an average depth of about 0.6 centimeters, which is a sizeable figure.

The most serious area of soil erosion in the Chang Jiang basin lies in the high mountain and gorge area of northern Yunnan Province, in the purple basin and hill region of Sichuan, and in the Qinba Shan region where annual soil erosion totals 1.25 billion tons.

Though erosion along the Chang Jiang is not as serious as along the Huang He, in numerous areas it far exceeds that of the Huang He. Survey shows that on cultivated slopes with a gradient of 10-30 degrees, soil erosion is a general 15,000-45,000 tons per square kilometer per year. On barren slopes, it is a general 10,000-20,000 tons per square kilometer per year. By contrast, in the stretch of the Huang He where erosion is most serious between Hekouzhen and Longmen, the erosion modulus is only 10,000 tons per square kilometer per year. This is far lower than for the Chang Jiang. Measurements taken on several rivers in the upper reaches of the Chang Jiang show an erosion modulus as follows: On the Jialing Jiang (at Lueyang Station), 2,190 tons per square kilometer per year; on the Min Jiang between Pengshan and Gaochang, 3,560 tons per square kilometer per year; on the Jinsha Jiang between Longjie and Qiaojia, 2,420 tons per square kilometer per year, and between Qiaojia and Pingshan, 2,280 tons per square kilometer per year. The erosion modulus for several rivers in north China is as follows: the Huang He above Lanzhou, 518 tons per kilometer per year; the Fen He, 1,360 tons per kilometer per year; the Zhang He, 950 tons per square kilometer per year, the Yongding He, 1,900 tons per kilometer per year, and the Luan He, 576 tons per kilometer per year, all of which are lower than the amount of silt in the Chang Jiang.

Soil is more precious for the Chang Jiang than for the Huang He. The soil layer is very thin in the Chang Jiang basin, usually being only several tens of meters thick or less. In places not protected by vegetation cover or on steep slopes that are cultivated, every time there is a torrential rain, the soil layer is washed bare exposing rock. Following scouring by a torrential rain in 1972, 150,000 mu of cultivated land in Zhen'an County in southern Shanxi was calamity stricken, and the surface soil on 20,000 mu of steep slopes was scoured clean exposing slabstone. There was no further soil available to run off or to grow plants, so the foundation for survival and activity of living organisms was completely lost. The green mountains and blue waters of the Chang Jiang basin in former times are seldom seen today. An example is the former forest reserves of Sichuan Province, which were second only to those of Heilongjiang Province in China. Immediately following Liberation, the forest cover rate was between 19 and 25 percent; today it is only 13.3 percent. As a result, soil erosion has now expanded to 380,000 square kilometers as compared with the 90,000 square kilometers of the 1950's, a more than fourfold increase and exceeding the 360,000 square kilometers of eroded area in the entire basin during the 1950's, a speed of increase that is truly frightening. During the 1950's, the eroded area of Jiangxi Province was only 11,000 square kilometers; during the 1960's, it was 18,000 square kilometers; and by the end of the 1970's, it had expanded to 215,000 square kilometers. In terms of area, erosion had doubled between the 1950's and 1970's. But in terms of volume, soil erosion in the 1970's was 160 million tons versus the 49.5 million tons of the 1950's, a 3.2-fold increase.

Soil erosion from hillsides inevitably leads to increase in the volume of silt in rivers. In the Tuo Jiang (at Sanhuangmiao) in the Chang Jiang's upper reaches, measurements showed an average 12.5 percent increase in the amount of silt carried in the 1970's as compared with the 1950's. In the Baisha He (at Yangliuping), a tributary of the Min Jiang, the amount of silt was 41 percent greater in the 1970's than in the 1950's. In the Heishui He (at Ningnan), a tributary of the Jinsha Jiang in Sichuan, the amount was 22 percent greater during the 1970's than during the 1960's. The volume of silt at the Cuntan Station on the mainstream of the Chang Jiang was double what it had been 20 years earlier.

In Jiangsu Province, comparison of the silt content of the Gan, Rao, Fu, Xiu and Xin rivers during the 1970's versus the 1950's showed no increase in the Gan Jiang; a 53.9-percent increase in the Anle He, a tributary of the Rao He; a 52-percent increase in the Chang Jiang; a 57-percent increase in the Xiu; a 21.5-percent increase in the Xin Jiang; and a 23.5-percent increase in the Fu He. The volume of silt carried into Boyang Hu by the five rivers was 18 percent greater in the 1970's than during the 1950's. Comparison of the Xiang, Zi, Yuan and Li rivers in Hunan Province for the period 1956-1966 with the period 1967-1977 showed a greater volumes of silt transported into Dongting Hu during the second 10-year period than during the first 10-year period as follows: 39.7 percent greater for the Xiang Jiang, 50.4 percent greater for the Yuan Jiang, 9.9 percent greater for the Li, and 15.2 percent greater for the Zi. The Qing River in Hubei Province was so named because its waters had been blue. Today it is turbid. Measurements taken at the Enshi Station showed 520,000 tons of silt transported in 1959. Between 1973 and 1977, the amount of silt transported averaged 1,414,000 tons, a 2.7-fold increase over 1959. At the Changyang Station, the amount was 60 percent greater during the 1970's than during the 1960's. Twenty years (1960-1979) of measurement data from the Tian He Hydrology Station in the upper reaches of the Han Jiang in western Hubei Province show a 56-percent increase over the previous 10 years in the amount of silt carried.

The foregoing survey and measurement data show that erosion in the Chang Jiang basin is serious and the speed of its increase frightening.

3. The Harm Caused by Erosion

The annual erosion of 2.4 billion tons of soil in the Chang Jiang basin is roughly equivalent to the erosion of 12 million mu of cultivated land (20 centimeters thick). Analysis shows this 2.4 billion tons of soil to contain 26.8 billion tons of nitrogen, phosphate, and potash, which amounts to a loss of the total amount of fertilizer produced over a 50-year period by a chemical fertilizer plant with a 500,000 ton annual output. In addition, the damage caused to fine fields by washing away and packing down in the erosion process is even greater.

Damage caused by flood waters. Each time the Chang Jiang floods, it causes huge disasters. The direct cause of flood disasters is torrential rains, it is true; however, another extremely important reason is the serious destruction of vegetation cover in the rainfall area. Soil is dumped into rivers, and the river beds steadily rise, which leads in turn to maintenance of a high flood level. Xu Zhenming, a water conservancy expert during the Ming Dynasty, propounded the important thesis that "control of rivers requires first the controlling of their source." To give attention only to the middle and lower reaches of rivers without devoting attention to water and soil conservation in the upper reaches will inevitably result in disaster. Surveys show that under similar conditions of torrential rains, where the forest cover is high, the extent of calamity is much lighter. An example occurred at Longwang Commune in Cangqi County on the Jialing Jiang where forests were cut bare during the Great Leap Forward. When 250 millimeters of rain fell there over a 3-day period in 1964, 100 mu of soil was washed away. This commune learned its lesson. It subsequently planted trees for afforestation to produce a 30-percent forest cover rate. When 290 millimeters of rain fell over a 2-day period in 1981, not a single mu of soil was washed away. Fixed position measurements made by the Sichuan Forestry Institute in the small basin of the Miyalu forest area showed that under similar rainfall conditions, the volume of flow in gullies in cutover land is two or three fold greater at flood crest than in gullies in forests. Convergence time is shortened by about 10 hours, and volume of flow during low water is less than half that in forest gullies. As a result of continued destruction of forests along the Min Jiang above Yuzui in Guan County, the volume of flow during low water was 30 cubic meters per second less in the 1970's than in the 1930's.

The foregoing figures show that forests are remarkably effective in reducing the amount of flood waters and in increasing the volume of flow during low water. Thus, serious attention must be given control of upper reaches. Vigorous water and soil conservation measures must be adopted, principally the planting of trees for afforestation in order to reduce or avoid flood disasters.

Today there are about 51,000 reservoirs in the Chang Jiang basin with a capacity totaling 114.6 billion cubic meters. These reservoirs have been silted to varying degrees. According to expert surveys of 20 Huang He and Chang Jiang reservoirs (with a capacity totaling 42 billion cubic meters) in 1979, most will be able to be used for less than 20 years. Volume of silt already amounted to 7,785,000,000 cubic meters, or 18.5 percent the reservoirs' total capacity. In Sichuan Province, there are 102 large and medium size reservoirs (with a total capacity of 4.23 billion cubic meters). Each year 16 million cubic meters of silt enters them. This is like the loss of one medium size reservoir each year. The Baiyutan hydroelectric power station at Hengyang in Hunan Province has a large reservoir with eight 20,000 kilowatt generators. But because silt has choked the approaches to the dam clogging the intakes of pressure pipes on three units, they are unable to generate electricity.

Silting of small water conservancy projects in the basin is even more serious. In Xuanwei County in Yunnan Province, for example, 12 of 48 small reservoirs have had to be abandoned as useless because of silting, and more than 500 of a total of more than 2,000 dammed ponds have become silted to the very top. These are no isolated examples; similar cases exist elsewhere.

In addition, the silting of rivers has increased the burden of flood prevention. Dongting Hu, for example, is a natural lake that regulates storage of flood waters from the Jing Jiang. But because of the large quantity of silt carried by the Chang Jiang into the lake and four entrances (at Songzi, Taiping, Ouchi, and Tiaoxian), and the deposit of silt on river beds, its capacity has been reduced and the passage of flood waters through the four entrances curtailed. During the past more than 20 years, flow capacity has been reduced by an average several hundred cubic meters per second annually. Qili Hu at Weilu on the Li Shui in Hunan Province formerly had a 1 million square kilometer surface and was able to store 1 billion cubic meters of water. Today, however, the lake bottom is deeply silted, and it is able to hold only 330 million cubic meters. Silting of the entry to the northern flood diversion locks of the Jing Jiang and of the flood diversion locks on the Han Jiang at Dujiatai has reduced the ability of flood waters to enter. Examples are numerous in which silting of locks on culverts along the Chang Jiang has reduced their effectiveness in light cases and submerged them rendering them useless in serious cases.

Navigation. The Chang Jiang water system is extremely convenient for navigation, and the river has been termed "a boat for the south and a horse for the north." But silting has forced a shortening of distances that can be navigated, and the choking of harbors by silt has caused difficulties in navigation. For example, in 1951 silting of the Daijiazhou channel between Hankou and Anqing forced suspension of navigation for up to a month between Hankou and Shanghai. Zhenjiang harbor was once a fine port, but silting caused its closure for 3 months in 1976. At the mouth of the Chang Jiang lies China's largest port of Shanghai, but because of silting of the channel caused by the annual arrival of almost 500 million tons of silt from the river's upper reaches, countless ever changing underwater deltas and huge sand bars have formed at the mouth of the river causing serious obstacles to the development of both domestic and international activities.

4. Understanding of Several Problems

1. Role of Forests in Runoff

Views differ as to how to solve the threat from Chang Jiang floodwaters, some people emphasizing the role of engineering projects while others emphasize the role of biology. The writer feels that "biological measures and engineering measures" must be used at the same time; however, under certain circumstances, biological measures are a fundamental solution.

Numerous examples everywhere show that if measures to protect; the biology of the upper reaches are ignored in the building of water conservancy projects, not only will full effectiveness in water conservancy be difficult, but "water conservancy" may become a water disaster. Take the 1981 flood disaster in Sichuan Province, for example. Though torrential rains were the main reason, the extent of the disaster was directly related to plant cover, and particularly to the destruction of forest cover.

Forests play a role in runoff in that the tree tops, branches, and leaves are able to intercept a fair proportion of the rainfall and directly moderate the falling rains' scouring of the soil, thereby reducing runoff of soil and silt. In addition, the debris that forms part of the forest cover, as well as the forest trees' root systems, and the animals form crevices in the forest soil that have strong ability to hold water. Some of the moisture that falls in the forest can percolate downward and be stored; consequently, for people to term forests "green reservoirs" is very sensible. However, sometimes in rainfall areas below forest areas or in plains areas, forests cannot play their role. Moreover, forests can only play a partial role in intercepting and storing precipitation. Consequently, in order to eliminate flood disasters, forests must be used in combination with engineering measures. Of course, forests still play a tremendous role in that they can provide building materials and energy; they can also regulate the climate, clean the air, and protect the environment.

2. Standards for Judging the Extent of Soil Erosion in the Chang Jiang Basin

In recent years numerous scientists have been extraordinarily concerned about the problem of soil erosion in the Chang Jiang basin, and numerous articles have appeared in periodicals. Some articles used the amount of erosion on slopes as their data, while others used the amount of silt carried off by streams, a gap existing between the two sets of figures. In discussing whether or not the Chang Jiang can turn into a "Huang He," each has drawn on data to support his own point of view. The fact is that the matter should be looked at both ways, so why can no unanimity of understanding be obtained? This is because both parties understanding of the data differ. I believe that in discussing the extent of soil erosion in the Chang Jiang basin, the amount of soil erosion from slopes should be used, with the volume of silt in rivers acting as parameters.

The soil particles that run off in the Chang Jiang basin are fairly coarse, and the amount of soil and silt that is eroded from hillsides that can be carried into rivers is a very small part while most is deposited along the way in the scouring process, i.e., a great difference exists between the amount that is carried in streams and the amount that is moved. The situation is as follows:

Name of River	Measuring Station	Slope Soil Runoff (10,000 tons)	Volume in Streams (10,000 tons)	Ratio of Amount of Runoff to Volume in Streams (%)
Jinsha Jiang	Pingshan	38,555	27,700	72
Min Jiang	Gaochang	9,534	5,532	58
Tuo Jiang	Lijiawan	3,866	760	19.6
Jialing Jiang	Beipei	35,448	19,240	54.2
Wu Jiang	Wulong	10,919	2,460	22.6
Chang Jiang	Yichang	130,000	50,000	38.5

The foregoing chart shows clearly that no definite laws operate with regard to the ratio between the volume of soil runoff for each river and the amount of silt carried in each stream. Many factors affect the ratio, some natural, some man-made. In the Jinsha Jiang, which runs through high mountain gorges with steep cliffs on both sides, the ratio of soil carried to soil moved is as high as 72 percent, which is to say that most of the soil eroded from slopes is carried into the river. The reverse is true for the Tuo Jiang, which flows across gentle terrain, so the ratio of soil carried to soil moved is less than 20 percent, which is to say that most of the soil eroded from slopes is deposited along the way before flowing into the river. Thus, in studying the ratio between amount carried and amount moved, specific analysis must be done. In the foregoing, for instance, the variation between the volume of silt in rivers and soil runoff from hillsides is great. This is not the case with the Huang He. There, the soil particles eroded from hillsides are fairly fine, and virtually all of them are carried into the river, so the ratio between the amount carried and the amount moved is close to 1. There, use of the volume of silt in the river to show runoff of soil from slopes is permissible.

One other thing is that when studying the volume of silt in rivers, it is also necessary to take into consideration the amount of silt that has accumulated in water conservancy facilities. Because water conservancy facilities block silt, though runoff from hillsides is very severe along certain streams in the Chang Jiang basin, the amount of silt contained in the rivers is not high, or may sometimes even be less than in the past. Baffled by surface appearances, some people express doubts about the increasing seriousness of erosion in the Chang Jiang basin. Since the 1950's, about 51,000 reservoirs with a capacity of 114.6 billion cubic meters have been built on the Chang Jiang's main course and its tributaries. Varying degrees of silting of these reservoirs has taken place. If a 10 percent figure is used, that comes to 11.5 billion cubic meters of silt that has been intercepted. Were it not for this silt, the volume of silt in the river would have increased manifold. So, when studying the amount of silt in rivers, the amount of silt in water conservancy facilities has to be taken into consideration too in order to reflect the actual situation with regard to the volume of silt in streams.

5. Suggestions

The Chang Jiang occupies a crucial position in the national economy. As a result of the long-term destruction of forests, the ecological environment has deteriorated. Serious erosion has already caused great losses for all sectors of the national economy. The following suggestions are especially offered by way of guarding against future flood disasters.

1. As a result of the erosion that the destruction of forests has caused, it is necessary to do a large amount of afforestation of mountains and hills, and to launch water and soil conservation work as one of the most important actions for harnessing the Chang Jiang. As quickly as possible, forest shelter belts should be built on both shores of the Chang Jiang's main stream, particularly in the section of the three gorges of the Chang Jiang for a rapid change in the current situation of looking only at the strategic location and difficulty of access of the three gorges without looking at their beauty.
2. Seriously eroded areas have one point in common, namely a lack of fuel. Following the current liberalization of rural policies, a lack of firewood is paramount. For example, more than 60 percent of the people of Xingguo County in Jiangxi Province lack firewood. In 1979, 90,000 of the 120,000 cubic meters of timber cut in Ningdu County was used for fuel and firewood. In some places, after the woods had been cut bare, sod was dug for use as fuel. In other places, when no fuel was to be found locally, searches were made at great distances. This shows that if a good job is to be done in water and soil conservation in these areas and erosion halted, the masses' problem of firewood must be solved. Development of biogas and use of solar energy are both very good ways of doing this, and Hubei, Sichuan and Shaanxi provinces are gaining rather good successful experiences in this regard. Simultaneously there must be energetic planting of trees for afforestation and the greening of bald mountains, both to control soil erosion and to solve the need for timber. In order to solve their fuel problems, places without new sources of energy as yet may use a combination of shrubs, bushes and grasses, but mostly grass and shrubs. This is to say, they should first grow grass and shrubs for a period of 1 or 2 years or longer, and after the soil has been improved, they should then plant forests or bushes. This will both increase soil fertility and produce firewood, and be in keeping with natural laws and economic laws in seriously eroded areas.
3. Earliest resolute action to protect existing forests. Places in the Chang Jiang basin having forests are really not very numerous, and where forests do exist, their destruction is continuing. If this continues, they will all be cut down within not many years. For example, the Wolong area of Sichuan Province has been made a natural sanctuary, and trees in this sanctuary are to be protected. This is not what happens, in fact, however. Within the sanctuary, destruction of forests and clearing of land for agriculture may be seen all around. Frequently mud and rock slides occur, and animal life has decreased. It is said that rare animals such as golden

monkeys could once be seen along the road, but now even birds are rarely seen. Emei Mountain is a famous scenic tourist spot in China in which the destruction of forests is serious today. It is now rare to see a completely forested hillside along the roads. The foregoing places are all places in China that have a fair number of forests. For this reason, it is suggested that departments concerned formulate regulations and take resolute and effective action to strictly prohibit entry into these areas.

4. Harnessing the mountains must be done in combination with harnessing of the rivers as the only effective way in which to control floodwaters. Many facts have demonstrated the remarkable role of forests in reducing floods and regulating runoff. Measurements have shown that a fine forest cover can soak up five times its own volume of rainfall. It has been calculated that 50,000 mu of forest can hold 1 million cubic meters of water. Vigorous planting of trees for the afforestation of bald mountains and wastelands in basins equals the construction of many, many small reservoirs.

History shows that several floods occurred in the Chang Jiang basin even during periods of fairly good forests. This shows that the ability of forests to intercept and store flood waters is limited. Since the Chang Jiang basin is characterized by a large volume of rainfall that falls during a concentrated period, effective ways of controlling flood waters must be found. Control of hillsides must be combined with control of streams. It is suggested that when launching tree planting for afforestation, and when building small projects in ravines that water conservancy projects for control also be built on principal rivers as local circumstances permit. This is the only way in which to control flood disasters effectively.

5. In order to understand completely and systematically the laws governing erosion in the Chang Jiang basin and the situation in water and soil conservation, it is hoped that departments concerned will once again organize study teams including people from many academic disciplines for continued study of other provinces (and regions) in the Chang Jiang basin.

6. Vigorous launching of experimental research must be done with the entire basin in mind. Small representative basins with different kinds of erosion may be chosen, and comparative experiments under diverse conditions may be done on water, soil, agriculture, and forestry. This is the foundation of research on water and soil conservation, and provides a scientific basis for water and soil conservation and control within the Chang Jiang basin.

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CSO: 5000/4179

SOIL EROSION IN GUANDONG IS SERIOUS, POOR LEADERSHIP HELD RESPONSIBLE

Guangzhou NANFANG RIBAO in Chinese 26 Mar 83 p 2

/Article by He Zhenlu /0149 2182 2464/: "We Must Pay Great Attention to Water and Soil Conservation Work"

/Editor's note/ Water and soil conservation means conserving both water and soil, promoting what is beneficial and abolishing what is harmful, and maintaining a fine ecological environment. This is the basis for the founding of the state and survival, and is a prerequisite for economic construction. These principles are of course very general, but this is precisely the issue people often overlook. According to data supplied by the recent provincial water and soil conservation work conference, soil erosion in Guangdong has not been stopped but is expanding and becoming worse. This serious situation must not continue! We hope all areas earnestly investigate and analyze local conditions of soil erosion, implement the "Forestry Law" and "Regulations on Water and Soil Conservation Work," and conscientiously stress water and soil conservation.

/Text/ From the provincial water and soil conservation work conference recently convened in Deqing County, this reporter has realized that damage to water and soil conservation remains serious everywhere and that soil erosion is expanding and becoming worse. It is hoped that leaders in all areas will pay great attention to water and soil conservation work.

Since the founding of the state, the broad masses of cadres and people in Guangdong have done a great deal of work in controlling soil erosion and have achieved considerable results. However, many areas implement control while damage is allowed to continue, and the pace of control lags behind damage. Because of neglect and inadequate management, effective control of soil erosion of 42 percent of the over 7,000 square kilometers in the province that underwent preliminary treatment have been lost. New, manmade soil erosion has been caused in numerous areas by the destruction of forests and reclamation of wasteland, cultivation on slopes, and removal of grass and collection of manure. According to incomplete statistics, soil erosion has increased to 592 square kilometers throughout the province. In the Meixian County area, where soil erosion is serious, the increase is 204 square kilometers in the few years since 1978. In Guangning County, where soil erosion was at first not serious, soil erosion has increased because of the destruction of forests, reclamation of wasteland, and indiscriminate lumbering. Judging from the results of the aerial photographic

survey last year in Xingning, Wuhua, Longchuan, Zhuhai and other counties and cities, soil erosion has generally increased from the 1950's.

This serious situation has not roused great attention in some areas so far. Leaders in these areas have not placed water and soil conservation on their daily agenda, the organizational structure is imperfect, personnel are limited, there is no assured source of funds, and, basically, no one manages conservation. Prior to the decade of turmoil, the number of technical cadres in water and soil conservation in the province was at most 173. Now, only 48 remain and there are only 16 people at grassroots conservancy stations. Some stations do not even have one technical cadre.

The positive and negative experiences of water and soil conservation work in all areas have proved that the key to water and soil conservation is the attention given by the leaders. In the areas where party and government leaders pay attention to it, conservation work develops smoothly and results are tangible. Otherwise, it becomes stagnant or suffers setbacks and damage. Deqing County, one of the counties which originally had the most serious soil erosion in the province, has been able to overcome the problem mainly because its successive party and government leaders have paid great attention to water and soil conservation work, regard it as the lifeline for building mountainous areas, placed it on their daily agenda, and conscientiously strengthened and substantiated the leadership. The county has set up a water and soil conservancy office responsible for planning, research and coordination with various departments. There is also a member of the leadership in special charge of this work in communes with serious soil erosion, achieving centralized, comprehensive and continual control. At present, 89 percent of the area in the county with soil erosion is being treated or controlled, and it has become the advanced example of large-scale soil erosion treatment in the whole country.

Why do leaders of some areas neglect water and soil conservation work? According to reports from different areas, it is mainly due to a lack of understanding about the importance and urgency of this work. Some believe that soil erosion in Guangdong is not serious and there is no need to make a mountain out of a molehill. Some feel that soil erosion is a "chronic disease" and it does not matter if the problem is taken care of later. Is soil erosion in Guangdong serious? Is it alright to deal with it later? We can find the correct answers from the data supplied by the conference. Our province has many typhoons and rainstorms, and the soil is easily eroded. In a particularly severe rainstorm in May last year, 220,000 mu of mountainous land in Qingyuan County were damaged, causing landslides at 140,000 spots. The present area with soil erosion in the province (including slightly eroded barren hills) has reached 60,000 square kilometers, or 30 percent of the total land area of the province. Of this, about 10,000 square kilometers have serious soil erosion, covering over 70 counties and cities. There are 38 counties and cities each with an area of soil erosion exceeding 100 square kilometers. Therefore, the view that soil erosion in our province is not serious does not accord with reality. Actually, soil erosion has caused serious harm to economic construction in our province. Analyzing statistics from related data in Shaoqing Prefecture alone, the amount of soil eroded in the prefecture each year is now over 15.15 million metric tons, equivalent to the loss of 15 centimeters of organic soil from 11,000 mu of farmland. Water and soil erosion not only creates great harm to agricultural

production but a great amount of mud and sand accumulate in reservoirs and waterways, reducing the benefits of reservoirs and the life of projects and affects the development of river shipping and transportation.

Numerous facts show that the prevention of soil erosion is a basic plan to benefit future generations. It is also an urgent task for economic construction that should arouse the great attention of party and government leaders in all areas. Therefore, this conference has suggested that party committees and government at all levels should place water and soil conservation work on their important daily agenda and comprehensively implement the "Regulations on Water and Soil Conservation Work." Areas that have the task of preventing soil erosion should set up water and soil conservation organizations, provide the necessary cadre and technical personnel, and carry out the system of job responsibility in order to conscientiously do this work well. At present, we should give particular prominence to the prevention of soil erosion and resolve to stop the unhealthy trend of excessive lumbering and reclamation.

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CSO: 5000/4159

STRESSING WATER, SOIL CONSERVATION TO IMPROVE AGRICULTURAL PRODUCTION

Conference Outlines Primary Tasks

Chengdu SICHUAN RIBAO in Chinese 3 Jan 83 p 1

[Article by Wang Junying [3769 0193 5391]

[Text] Implementing the "Regulations on Water and Soil Conservation Work" on an overall basis, strengthening water and soil conservation work, preventing and controlling soil erosion, protecting, cultivating and rationally utilizing water and soil resources to create a good ecological environment for developing the national economy were the central themes of the provincial water and soil conservation work conference recently held in Pujiang County. Responsible comrades of the agricultural offices of the localities, cities and prefectures and the departments of agriculture, forestry and water conservancy attended.

The area of soil erosion in Sichuan is large. In particular, there are more people and less land in the basin. Slope land is concentrated. The soil layers are infertile, and there is a lot of farmland on slopes that suffer from serious soil erosion. This region plays an important role in the province's agricultural production, and should be the key control region in carrying out water and soil conservation work well. The valleys are deep and the slopes are steep in the mountain regions bordering the basin, vegetation is poor, torrential rains are strong, damage by landslips, slides, and mud flows are frequent. Water and soil conservation work in these regions is also very important. Since the founding of the nation, each locality concentrated on water and soil conservation work and realized definite results, but because of the influence of the mistaken "leftist" guiding ideology of the past, the understanding of the importance of water and soil conservation was insufficient, there was a lack of plans for overall control, there was little consideration for the utilization of all water and soil resources, water and soil conservation measures were singular, coordination was insufficient, policies changed frequently, efforts were carried out sporadically, the traditional method of the masses to carry sand to cover the soil, and other experiences were not summarized, improved and popularized sufficiently. At the same time, because of the many changes in policy, uncontrolled felling of forests, destroying forests for reclamation, and other reasons, soil erosion in some regions became worse.

The conference transmitted and implemented the spirit of the fourth national water and soil conservation work conference, studied the "Regulations on Water and Soil Conservation Work" promulgated by the State Council this year and the directive by the leading comrades of the Central Committee to vigorously promote two changes in guiding agricultural production (i.e., one, to change from only emphasizing grain production and emphasize diversification; two, to change from only emphasizing water conservancy construction on farmland and emphasize water and soil conservation, and improving vegetation). Suining and Pujiang counties introduced their experience at the meeting. Everyone visited the reservoir areas of Chaoyang, Changtan, and Shizi in Pujiang County and the nearby ecological environment of clean water and green mountains resulting from measures to manage the small river valley. They were encouraged and their confidence to control soil erosion was strengthened. Everyone believed that in order to implement the "Regulations on Water and Soil Conservation" and to strengthen water and soil conservation work, the important meaning of water and soil conservation must be greatly propagandized at present and the prevention and control of soil erosion must become a self-conscious activity of the broad masses. The "Emergency Directive on Stopping the Destructive Felling of Trees" issued by the Central Committee must be continually implemented to protect forests well. The series of rural economic policies since the Third Plenum must be continually implemented, the enthusiasm of the collective and the individual must be mobilized, the forces of all sectors of society must concentrate on water and soil conservation work, combine water and soil conservation work with the development of the mountain regions and the economy of the hilly regions to increase the income of the masses. Basic farmland must be constructed in the mountain regions to increase unit yield. Forests must never be destroyed to plant grain crops. Steep slopeland withdrawn from farming and returned as forest land and grazing land must be planted with trees and grass. The conference believes that in order to do the work of water and soil conservation well, we must make overall plans according to the river valleys and water systems. We must carry out comprehensive control using biological measures, engineering measures, and farming measures. Under the guidance of the plans, we must do the work of comprehensive management at test points in small river valleys well, and develop their exemplary role. Water and soil conservation must be suited to local conditions, and be guided separately. We must rely on policy, rely on labor accumulation, rely on the farmers' own strength, and actively carry out the work. The conference also asked all concerned sectors to strengthen scientific research work on water and soil conservation, train technical backbone cadres, summarize the experience of the masses, combine traditional science and modern science. Each locality should strengthen the establishment of special agencies for water and soil conservation, and assign necessary specialized personnel to the task.

Rural Needs Detailed

Chengdu SICHUAN RIBAO in Chinese 2 Jan 83 p 2

[Article by Shen Longban [3088 7127 6586]

[Text] Sichuan has a lot of slopeland. The percentage of covering by vegetation is low and uneven. The area of soil erosion is large, and the ecological balance is worsening. Drought and flood disasters are more and more frequent. In 1981 and 1982, the province suffered especially large floods continuously. Serious sinking of the ground, slippage of slopes, landslides, and mud flows occurred at some places and caused great damage. We must learn this lesson, conscientiously implement the "Regulations on Water and Soil Conservation Work" promulgated by the State Council, emphasize water and soil conservation, improve vegetation, and create a new situation in water and soil conservation in Sichuan.

Water and soil conservation has a broad mass character and social character. Each concerned department must cooperate and work in coordination. We must rely on the strength of the communes and brigades, and the masses, be self-reliant, and struggle hard. At the same time, we must mobilize the social strength in the cities and villages, and launch tasks that benefit water and soil conservation such as compulsory planting of trees, and preventing and controlling water pollution. At present, we must strictly forbid the uncontrolled felling of trees, strictly prohibit the destruction of forests, the burning of mountains for reclamation, and reclamation of slopes for grazing grass. Second, we must strictly prohibit uncontrolled occupation and abuse of good farmland, the waste of land, and the destruction of resources. Third, we must prohibit reclamation and planting agricultural crops on slopes greater than 25 degrees. Effective measures must be adopted promptly to stop the cultivation of land that has been reclaimed and forests and vegetation should be restored. Fourth, we must prohibit reclamation and mining dangerous regions of landslides and landslips, and regions where mud flows frequently occur.

Water and soil conservation must adhere to uniform planning, comprehensive treatment, centralized control, continuous control and practicality. At places where soil erosion is serious and the treatment task is great, separate regions using the small river valley as the unit can be treated. We must use such field construction measures as building ridges and terraces, digging ditches along mountains, digging sand settling ponds, water storing pools, and other agricultural measures such as planting on horizontal slopes, strip planting, and improvement of soil structure, each area must suit the measures to local conditions. Plant preparation is especially important. We must select the types of trees that are adaptable, that have many uses, that grow quickly and that have many benefits, combine the planting of arbor, shrub and herbs, develop fuel forests, shelter forests, economic forests, and timber forests. We must rationally utilize grassland, grass slopes, grazing fields, implement artificial planting of grazing grasses, improve the natural grazing fields, and improve the quality of grass. Plants and mines, transportation, hydroelectricity and rural sideline production that require excavation, effective measures must be used to control the destruction of geomorphology, vegetation and ground

surface sinking due to construction and production, and we must uniformly inspect the land after construction is completed. We must persist on control throughout the year. We must exert more efforts when farm work is slack and less control during the busy season. The present time is a great opportunity to carry out capital construction in agriculture. Besides carrying out construction measures, we must encourage commune masses to gather sand to cover the surface of the soil and improve the soil of the land they have contracted to work on.

Water and soil conservation is a fundamental measure to develop production in the hilly and mountainous regions, to cure poverty and become rich, and to create a prosperous economy. We must establish stable relationships among the farmers, land, mountain slopes and grazing fields, truly realize using the land to nurture the land, rely on the riches of the mountains, protect the mountains, and protect water and soil resources. We must insist on suiting measures to local conditions, and fully develop local advantages, if farming is suitable, we should develop farming, if forestry is suitable, we should develop forestry, if livestock breeding is suitable, we should develop livestock breeding, and closely combine water and soil conservation measures with the development of production. We must not engage in arbitrary uniformity. After the responsibility system of linking production to contract work by rural families in the province became the major form among the various types of agricultural production responsibility systems, a large amount of work has been contracted by the family as the unit. We must proceed from a small scale and from the characteristics of specialization and socialization, implement appropriate policies and forms, and mobilize the enthusiasm of the commune members to engage in water and soil conservation. For example, in localities lacking firewood, we should encourage the planting of fast growing trees to solve the problem of firewood for the masses. In mountainous regions where the soil is infertile, and the economy is poor, we should advocate building basic farmland, increase unit yield, and develop diversification. The hilly regions have less land and a dense population, the rate of reclamation is high, and in the past, planting "the entire mountain" caused soil erosion to increase. We should especially pay attention to water and soil conservation measures in these regions.

The key to water and soil conservation is to strengthen leadership. Each level must exert efforts to implement policy, train a scientific and technical force, concentrate on the plans and their implementation, emphasize organization and coordination, mobilize the masses, and carry out inspection and supervision. As long as the leadership at each level conscientiously emphasizes and persists in these efforts for several years, there will surely be results.

9296

CSO: 5000/4125

EMPHASIZING THE ADVANTAGES OF CONTRACTING THE MANAGEMENT OF SMALL RIVER VALLEYS

Lanzhou GANSU RIBAO in Chinese 12 May 83 p 1

[Editorial: "Contracting the Management of Small River Valleys Is a Good Method"]

[Text] The management of small river valleys should elicit our close attention. The method of carrying out comprehensive management of small river valleys through household contracts or joint household contracts deserves recommendation and popularization.

A large part of Gansu is situated in the loess plateau region, the forest cover rate is low, vegetation is sparse, soil erosion is severe and the ecological balance is disturbed. An urgent, important question currently facing us is how to bring about a rapid change in this situation. Since the implementation of the responsibility system in rural areas, the household and joint household contracts created by the masses have been combined with the application of engineering and biological measures to carry out the comprehensive management of small river valleys. The results are good and the pace is fast, it is a good method. Its vitality lies in combining duty and responsibility, and in mobilizing the enthusiasm of thousands of households. If every area were to do this, and to persevere, their power would be extremely great. If each individual small river valley were brought under control, we could then combine many small successes into one big success, the severe soil erosion could be improved and the ecological environment could develop in beneficial cycles. Every area must liberate its thinking on these issues, go all out in putting the barren hills, gullies and slopes into the hands of the peasants, and encourage the peasants to plant trees and grass and to carry out comprehensive management of small river valleys through household or joint household contracts. If we do this, it will enable the peasants to increase ways of becoming prosperous and obtain benefits. In addition, from an overall and long-range point of view, it is the entire nation and society that will benefit. It not only has great advantages for the present, at the same time, it will pave the way for future generations.

Regardless of whether it is by household, joint household contacts or by adopting some other method to carry out the comprehensive management of small river valleys, we must have everything planned in advance, then we can go about the work separately. In this way, we can avoid having too many things to take care of at the same time, and it will enable the contractors to know exactly where things stand, to speed up management and to improve results.

NATIONAL CONFERENCE ON RESEARCH PLANS FOR AGRICULTURAL ENVIRONMENTAL PROTECTION

Tianjin NONGYE HUANJING BAOHU [AGRICULTURAL ENVIRONMENTAL PROTECTION] in Chinese No 2, 1983 p 32

[Report by Duan Wude [3008 2976 1795]]

[Text] The Environmental Protection Office of the Ministry of Agriculture, Animal Husbandry and Fishery convened a National Conference on Scientific Research Plans for Agricultural Environmental Protection in Shanghai from 24 to 31 January 1983. Eighty persons from related agricultural units, scientific research units on agricultural environmental protection of environmental protection departments and some universities took part in the conference. The participants summed up and exchanged achievements and experiences on agricultural environmental research in China in the past few years; they spoke glowingly of the excellent situation on the agricultural front and on environmental protection, and future tasks. They heard the reports and speeches made by the following comrades: Zhu Zhenkui [2612 4176 5525], president assistant of Zhejiang Agricultural University; Mai Yongbin [6314 3057 1755], director of the Environmental Protection Institute under the Ministry of Agriculture, Animal Husbandry and Fishery; and Chen Ziyuan [7115 1311 03372], vice president of Zhejiang Agricultural University.

Everyone put forward many good proposals and suggestions on how to do a better job in launching agricultural environmental research after the conference; the direction and tasks for agriculture environmental research; how to gear agricultural environmental research to the needs of agricultural production and economic construction; how to do a good job in the demonstration and popularization of the achievements gained in agricultural environmental research, as well as how to organize coordinated scientific research to tackle key problems, especially cooperation among different departments, industries and disciplines and how to concentrate force to accomplish the key projects of the nation.

In the final phase of the conference, discussions on different topics were held, revisions were made to the 1983 plan on agricultural environmental research, and the 1983 research tasks and the schedule for realization were determined.

Comrades participating in the conference generally agreed that it was a lively conference and attained the expected goal, and that they will rise with spirit and work hard to make positive contributions to China's agricultural environmental protection.

BRIEFS

SHANXI AFFORESTATION--According to statistics compiled in the middle of May, Shanxi Province had planted 233 million trees, overfulfilling the planned target by 16.8 percent, afforested 3.08 million mu, topping the plan by 23.3 percent, and cultivated some 658,000 mu of saplings, accounting for 65.8 percent of the annual plan. Of this, 1.43 million mu of trees and some 190,000 mu of saplings were planted by specialized households and households specializing in other undertaking besides tree planting. Some 81.83 million trees were planted on a voluntary basis, an increase of 17 percent over the corresponding 1982 period. Voluntary afforestation and saplings cultivation totaled 443,000 mu and 8,700 mu respectively. [Summary] [Taiyuan SHANXI RIBAO in Chinese 6 Jun 83 p 1 SK]

SHANXI TREE-PLANTING ACHIEVEMENTS--Yanbei Prefecture, Shanxi Province, scored marked achievements in planting trees this spring. It planted 1,048 million mu of trees, accounting for one-fifth of its original forest acreage. [Excerpts] [Taiyuan SHANXI RIBAO in Chinese 25 May 83 p 1 SK]

NEI MONGGOL SPRING AFFORESTATION--Nei Monggol Region has fulfilled the spring afforestation plan. By 25 May, the region has afforested 4.14 million mu, fulfilling 81.7 percent of the annual plan. [Summary] [Hohhot Nei Monggol Regional Service in Mandarin 1100 GMT 31 May 83 SK]

PRC, CANADA EXTEND FORESTRY COOPERATION--Ottawa, July 22 (XINHUA)--China and Canada have extended a three-year memorandum for another three years to strengthen their cooperation in forestry. The agreement on the extension of the memorandum was reached by Chinese Minister for Forestry Yang Zhong and Canadian Minister for Environment and Science John Roberts during their recent talks here. The memorandum of understanding from April 1981 to April 1984 was signed between the two countries in 1981. During their talks, Yang and Roberts expressed satisfaction at the progress in cooperation in forestry between the two countries in the past year. Yang and his forestry delegation arrived here on July 8. They have visited farms, forestry products, processing factories and research centers. The delegation will leave here tomorrow for the United States. [Text] [OW231114 Beijing XINHUA in English 0717 GMT 23 Jul 83]

EIGHT NEW NATURE RESERVES--With the approval of the provincial People's Government, eight new nature reserves were added to the province recently. This was the third group of nature reserves approved this year, following those of Lianhua Shan, Daxiao Sugan Hu, the marsh between Mazong Shan and Dahei Shan, and the Tuhai Nature Reserve. With this new group, Gansu now has 17 designated nature reserves, totaling 610,000 qing in area, accounting for 1.36 percent of the land of the province. A network of nature reserves has been formed. The eight new nature reserves are forest areas, belonging either to the forest ecological system or to the semidesert ecological system. The major objects of protection are the Black Spruce Nature Reserve of Guozhagou along the upper reaches of the Tao He, the Xinglong Shan Scenic Spruce Forest of Yuzhong County and its Natural Ecological System Reserve, Kongtong Shan Forest Cover of Pingliang County and a famous historic site Nature Reserve, the Liangucheng Desert Plants Nature Reserve of Minqin County, Tianshui Prefecture First, Second, and Third Shoals Takin Subtropical Humid Forest Landscape Type Natural Ecological Protection Reserve, Xiaolong Shan Maicaogou Qinggang Secondary Forest Nature Reserve, Xiaolong Shan Heihe Subtropical Humid Forest Landscape Type Natural Ecological System Reserve, North Gansu Yandiwan White-lipped Deer and Wild Yak etc, plateau ungulates and their ecological environment reserve. [Text] [Lanzhou GANSU RIBAO in Chinese 7 Dec 82 p 1] 6248

PESTICIDE POLLUTION RESEARCH--Tianman County, Hubei Province, is a well-known cotton-producing area in China, there are 780,000 mu of cotton fields, the annual yield of cotton is 0.8-1.0 million dan, accounting for 1.2 percent to 1.5 percent of the total national yield. Since 1952, 120,000 tons of 71 kinds of chemical pesticides have been applied in preventing and controlling plant diseases and insect pests in Tianmen County, ranking first place in Hubei Province. Because the application of chemical pesticides is in great amounts, over a long period of time and widespread, especially the application of great amounts of toxic organic chloride pesticides, the air, water, soil and crops as well as each link of the food chain are all contaminated to varying degrees. In order to find an effective way to protect the agricultural environment, the State Scientific and Technological Commission and the Ministry of Urban and Rural Construction and Environmental Protection, have transmitted papers for launching scientific research on the prevention of pesticide pollution in Tianman County, Hubei Province. The major contents of this scientific research are: to investigate pesticides pollution, mainly organic chloride pesticides in this county and other places; to study the direction in which pesticides enter in the soil and crops, to explore ways to prevent pesticide pollution in soil and crops; to study pesticides residues in the human body and health effects. These research tasks will be completed in 3 years and have been assigned to the Hubei Provincial Research Institute of Environmental Protection, the Hubei Provincial Environmental Monitoring Station, the Hygiene Department of Wuhan Medical College and the Environmental Monitoring Station of Tianman County. This research will begin in 1983. [Jiang Chongyang] [Text] [Tianjin NONGYE HUANJING BAOHU [AGRICULTURAL ENVIRONMENTAL PROTECTION] in Chinese No 2, 1983 p 30]

12272

CSO: 5000/4175

MAJOR SOURCES OF AIR POLLUTION IN LANZHOU DISCUSSED, CONTROL MEASURES
SUGGESTED

Beijing ZHONGGUO HUANJING KEXUE [ENVIRONMENTAL SCIENCES IN CHINA] in
Chinese No 2, 1983 pp 60-63

[Article by Tian Bingshen [3944 3521 3947], Gansu Provincial Environmental
Protection Institute: "Characteristics of Atmospheric Pollution in the
Lanzhou Area, and its Prevention and Control"]

[Text] The Lanzhou urban area has almost 100 industrial plants, and the
urban population numbers 1 million. All sorts of pollution sources
discharge large quantities of pollutants into the air each day, and
this plus special topographical and meteorological factors frequently
cause the Lanzhou area to be blanketed with smog. Numerous pollutants
exceed standards, making the city notorious throughout the country for
its serious atmospheric pollution.

Characteristics of Atmospheric Pollution in the Lanzhou Area

1. The Lanzhou area is subject to numerous types of atmospheric
pollution. The air over the long, narrow, and not very large Lanzhou
basin (meaning the four districts of Chengguan, Qili He, Anning and
Xigu) contains sulfur dioxide, and coal smoke and dust pollution caused
by the burning of coal, and it also contains photochemical smog pollution
caused by the burning of petroleum, exhaust gases from the petrochemical
industry, and automobile exhaust gases. In addition, it has hydro-
fluoride pollution. The simultaneous existence of such numerous types
of atmospheric pollution in such a limited area is rare in China, and
examples abroad are not numerous either. Since atmospheric pollution of
this area is so complex, it poses numerous increased difficulties for
prevention and control.

The eastern half of the Lanzhou urban area (Qiguan and Qili He districts)
are densely populated. Hundreds of small urban area and street industrial
plants are spread all over the area, and there are thousands of boilers
used in production and daily life, boilers used for making tea, and
messhall stoves, all of which use coal for fuel. These discharge large
amounts of ashes and sulfur dioxide daily, and more than 130,000 small
stoves owned by residents everywhere send forth smoke continuously.

During winter, in particular, the discharge of pollutants of all kinds is more than double what it is normally, causing serious sulfur dioxide and coal smoke and dust pollution. (See Table 1). Table 1 shows that in winter and summer alike the density of airborne dust is fairly high, the amount being higher in winter than summer and greatly in excess of national standards. In summer, the average density of sulfur dioxide in the atmosphere does not exceed standards, but in winter the density is fairly high exceeding standards by between 0.2 and 10.5 times. Carbon monoxide and NO_x also markedly exceed standards. Now let us compare the atmospheric pollution situation in the Lanzhou urban area during December 1977 with the pollution situation in London, England during the smog incident of December 1952. (See Table 2). It is clear that the degree of atmospheric pollution in the Lanzhou urban area during December 1977 was close to the serious situation that existed in London during the smog incident.

Major Atmospheric Pollutants in Excess of Standards in the Lanzhou Urban Area 1974-1977

Table 1

Atmospheric Pollutant	Average Summer Density mg/M^3	Average Winter Density mg/M^3	Average Daily Density, National Secondary Standard mg/M^3	Number of Times Above Standards in Winter
Air-borne Dust	0.3-0.88	1.2-3.5	0.15	7-22.4
SO_2	0.01-0.12	0.19-1.72	0.15	0.2-10.5
CO	1.05-2.70	2.70-14.83	4.00	0-2.7
NO_x	0.01-0.25	0.15-0.62	0.10	0.5-5.2

Comparison of Atmospheric Pollution in Lanzhou With London Smog Incident

Table 2

Place	Time	Density of Airborne Dust mg/M^3	Sulfur Dioxide Density mg/M^3
London	December 1952 (5 Day Average)	3.25	0.951
Lanzhou	December 1977 (5 Day Average)	2.5	0.77

The western half of the Lanzhou urban area (mostly Xigu District) is one of the country's major petroleum bases. The district is not large in area, but it is packed with industrial plants. Chimneys stand like forest trees and discharge large amounts of hydrocarbons, NO_x , sulfur dioxide, and carbon monoxide pollutants daily. In addition, the area has a river basin topography; it is fairly high above sea level; and ultra-violet radiation is strong, conditions that are very favorable for the formation of photochemical smog. In fact, ever since 1974 Xigu District has regularly had a light blue smog during summer that irritates the eyes, causes breathing difficulties, and damages the leaves of plants. On-site atmospheric pollution monitoring and surveys of communicable diseases (1, 2) conducted during 1978 and 1979 by the Gansu Provincial Environmental Protection Institute, the Lanzhou Chemical Company Environmental Protection Institute, and the Beijing University Technical Physics Department discovered the existence in the air over Xigu District of smog containing major secondary pollutants such as ozone and peroxyacetyl nitrate (PAN).³ Ozone density (average hourly) frequently exceeded 100 ppb (national tertiary standard) during summer. At times, PAN reached 24 ppb, causing marked human reaction. It has been demonstrated that serious photochemical smog pollution already exists in that district, and this marks the first time that this type atmospheric pollution has been discovered in China.

In addition, serious hydrogen fluoride pollution also exists in Xigu District. The main polluters are two electrolytic aluminum plants, one of which, the Lanzhou Aluminum Plant, annually discharges about 565 tons of hydrogen fluoride into the atmosphere. This hydrogen fluoride frequently forms into a dense white smog over the industrial district, and seriously pollutes the surrounding environment after it has been scattered by the wind. Downwind at Xinlancun, and 10 kilometers away at Zhangjiadaping, hydrogen fluoride density was tested at 0.02 milligrams per cubic meter, triple the health standard.

2. Aerosol pollution (or airborne dust pollution) causes most damage to the Lanzhou area. Both the sulfur dioxide and coal smoke and dust pollution of the Chengguan District and the photochemical smog pollution of Xigu District share a common characteristic of serious aerosol formation resulting from large amounts of airborne dust in the atmosphere. During the winter of 1977, airborne dust density in the Lanzhou urban area reached a maximum value of 3.50 milligrams per cubic meter, which was 22.4 times higher than national standards, making Lanzhou the country's city most seriously polluted by airborne dust. Though airborne dust pollution has decreased in recent years, it remains markedly above standards. As a result of scattering by the sun of large quantities of aerosol particles, the air over the Lanzhou urban area becomes murky, visibility is low, and the entire city is frequently enveloped in smog.

Aerosol particles have a diameter as small as 10 microns, which enables them to float in the air for several days or many years. Though small in volume, their composition is extremely complex.⁴ Gansu Provincial

Environmental Protection Institute analysis of samples showed aerosol particles from the Lanzhou urban area to contain heavy metals including lead, cadmium, arsenic, chromium, copper, zinc, manganese, and nickel. Average density of highly toxic lead was 0.86 micrograms per cubic meter, which was higher than nationally prescribed standards. Organic pollutants absorbed by airborne dust in the Lanzhou area were even more complex.⁵ Preliminary analysis showed 144 different pollutants, including 47 different aromatic hydrocarbon. Results of analysis of samples taken during the winter of 1980-1981 showed airborne dust over the Lanzhou area to contain about 50 micrograms per 1,000 cubic meters of highly carcinogenic 3,4 benzopyrene. This was close to the maximum density of 3,4, benzopyrene found during the 1950's and 1960's in fairly polluted cities of Europe, the United States, and Japan, and was from several times to several tens of times as much 3,4, benzopyrene as was found in Beijing's airborne dust in 1979.

The serious aerosol pollution in the Lanzhou area has already affected the intensity of solar radiation there. At Xinlancun in Xigu District, where the atmosphere is murkiest, solar radiation is almost 50 percent weaker than in the Dunhuang area where the skies are clear. In the Fuli area of Xigu, solar radiation is almost 40 percent weaker, and in the eastern part of Chengguan District, it is more than 25 percent weaker than in Dunhuang. The drop in solar radiation intensity, and particularly weakening of ultra-violet light has deleterious effects on the human body and living organisms. Furthermore, the large amount of airborne dust, the large number of foggy days, and the weak solar radiation from the surface of the earth makes dispersal of the inversion layer difficult, and creation of serious atmospheric pollution easier. This is the situation prevailing in the Lanzhou area during winter.

3. The seriousness of atmospheric pollution in the Lanzhou area is extremely dependent on meteorological conditions. The interrelationship between atmospheric pollution and meteorological factors is a general law; however, the extent to which atmospheric pollution in the Lanzhou area is dependent on meteorological factors is greater and more typical than elsewhere. Analysis of sources of pollution shows no very great differences between Lanzhou and other cities in north China; in fact, the overall amount of pollutants discharged is somewhat less in Lanzhou. So why is atmospheric pollution in Lanzhou vastly more serious than in other cities? The reasons lie in the topography, and particularly in the distinctive meteorological conditions. Located in a river valley basin between two facing mountains, Lanzhou city has limited air space. In addition, wind velocity is small during most of the year (averaging only 0.94 meters per second annually), and in winter the static air rate is high, the number of air inversion days numerous, and the inversion layer like a "cauldron lid" that regularly prevents air from rising from the city. Atmospheric pollutants are not scattered, and can only accumulate and circulate in the limited space close to the surface of the ground. These distinctive topography and meteorological conditions cause the capacity of the Lanzhou urban area's atmospheric environment

to be much smaller than the capacity of the air environment of plains cities. A small environmental capacity combined with discharges from large numbers of pollution sources must inevitably lead to serious atmospheric pollution.

The important characteristic of meteorological conditions in the Lanzhou urban area is the extraordinarily serious inversion. Monitoring data since 1969⁶ shows inversion to exist year round in the air above the Lanzhou urban area. Statistics show inversion on an average of 310 days each year, or 86 percent of the time. Inversion frequency is highest during winter, when inversion occurred an average of 89 days during 3 months, or 99 percent of the time. In winter the inversion layer is also thicker than at any time during the year. In December, the inversion layer that hugs the ground is more than 700 meters thick. It is also in winter that the intensity of the inversion layer is greatest. At 7 p.m. intensity of the inversion layer close to the ground reaches 1.2°C per 100 meters, and the inversion layer may endure for more than 18 hours a day disappearing only around noon, but sometimes not dissipating all day long. The Lanzhou area's serious atmospheric pollution is closely interrelated to the prominent meteorological inversion conditions in the urban area. Winter, when the inversion layer is thickest, its intensity greatest, and its duration longest, is also the season when atmosphere pollution is most severe (See Table 1). In winter, daily changes in atmospheric pollution in the urban area are entirely synonymous with the pattern of development and dissipation of the inversion layer. This means that when the inversion layer usually disappears around noon, atmospheric visibility becomes better and pollution decreases. Toward evening and during the morning when inversion is serious, atmospheric visibility is very poor and it is impossible to see anything clearly beyond several hundred meters, and atmospheric pollution increases markedly.⁷ (See Table 3)

Table 3 on following page

Daily Changes in Average Sulfur Dioxide Density in Lanzhou Urban Area
(Winter, 1979)

Table 3

Particulars

Average SO₂ Density (mg/M³)

Location

Time

2 6 8 10 12 14 16 18 20 22 24

Busy

Inter-
section
in

Nanguan

District 0.18 0.33 0.67 0.28 0.29 0.20 0.26 30.9 0.42 0.57 0.37

Lanzhou

Train

Station 0.20 0.34 0.32 0.46 0.29 0.25 0.24 0.29 0.59 0.49 0.26

Prevention and Control of Atmospheric Pollution in Lanzhou Urban Area

Leaders at all levels of the central, provincial, and municipal government are extremely concerned about Lanzhou's serious atmospheric pollution and have taken a series of actions to control it in recent years, with preliminary effectiveness. Today, additional countermeasures are being put into effect or soon will be.

1. Strengthening of city planning and taking the initiative in prevention and control of atmospheric pollution. Atmospheric pollution is part and parcel of urban population increase and the concentration of industrial plants. As far as rapid growth of the city is concerned, strengthening of urban planning, limiting the size of population, and a rational distribution of industry are extraordinarily important in protecting the atmospheric environment. As was said in the foregoing, the area of land in the Lanzhou urban area that can be provided for planned use is extremely limited, and capacity of the atmospheric environment is also extremely small. Nevertheless, industry is overly concentrated in Lanzhou today, and discharge of various kinds of pollutants already surpasses the atmosphere's cleansing capabilities. Take Chengguan District, for example. Here 30.4 square kilometers of city land is used for 395 industrial plants, large and small. Plant concentration averages 13 per square kilometer (In Xuanwu District, Beijing's area of greatest industrial concentration, industrial plants average 12.4 per square kilometer, and this is Beijing's most heavily polluted area). In view of Lanzhou's present state and

objective conditions, no further expansion of industry can take place in the urban area, and the city's population cannot increase either. Lanzhou is an industrial city that manufactures mostly petroleum, industrial chemicals, and machinery. Petroleum, chemical, machinery, metallurgy, electric power, and coal industries account for 51.8 percent of the city's total industrial enterprises. They are also industries that have a serious affect on the quality of the atmosphere, so control of the size and number of such industries in the urban area is imperative. In 1980, one-third of Lanzhou's land area was used for industry. In recent years further use of land for industrial purposes has been brought under control, and increase in new sources of pollution within the city has been strictly prohibited. Today, the entire city is in the midst of safe development and renovation in atmospheric pollution under control gradually over a period of time.

2. Readjustment of the irrational industrial pattern, with resolute implementation of measures to suspend, retool, merge, change, or move out of the city industrial enterprises that cause serious pollution. Industrial waste gas is Lanzhou's main source of pollution, and the harm caused by an irrational industrial pattern is very great. During the Great Leap Forward and the era of turmoil, construction of some seriously polluting industries upwind from a densely inhabited area threw into confusion rational urban plans and division of the city into functional districts, and brought about a serious pollution situation. A rough survey conducted in 1979 showed about 166 industrial enterprises in the city causing fairly serious pollution, 80 percent of them being local and street industrial plants. Most of these plants used indigenous methods to do their work; their facilities were rudimentary; they paid no attention to treatment of the three wastes [waste gas, waste water, and industrial residues]; they seriously polluted the environment; and they were mixed in among residential areas causing strong opposition from the masses. The problem of these industries that seriously pollute the environment has been settled on a case by case basis, or else they have been moved to several areas of a different nature or to areas where street industries are concentrated. Alternatively, industrial enterprises of the same kinds have been merged or required to use in common certain technology and boiler rooms. In other cases, some seriously polluting plants and workshops have been forcibly closed down or moved out of the city. These decisive measures have effectively improved the atmospheric environment of the Lanzhou urban area.

3. Areawide central supply of heat. Supplying heat centrally, substituting the use of large boilers for small heating stoves has markedly reduced atmospheric pollution. The Lanzhou No 2 Thermal Power Plant now under construction is one major means by which central supply of heat can be developed to solve Lanzhou's atmospheric pollution. Once the plant has been built, it will be able to solve needs for winter heat at home and at work throughout most of the urban area, and will be able to supply entirely needs for steam in production of 32 industrial and mining entrepreneurial units, thereby replacing several hundred heating boilers and several tens of thousands of small heating stoves in the entire eastern

section of the city. Data from a No 2 Thermal Power Plant gain and loss analysis of effects on the atmospheric environment show that immediately after the No 2 Thermal Power Plant goes into production, when the centralized heat supply rate is 50 percent, 50 percent of all heating stoves can be replaced, and the daily average density of sulfur dioxide in the atmosphere at each evaluation site will decrease by more than 50 percent. When the No 2 Thermal Power Plant's centralized heat supply rate reaches 100 percent, the daily average density of sulfur dioxide in the centrally heated area will fall from being in excess of standards to less than 0.100 milligrams per cubic meter, and in one-third of the area the daily average density will be between 0.010 and 0.005 milligrams per cubic meter. In another one-third of the area, the daily average density will be less than 0.005 milligrams per cubic meter. Sulfur dioxide pollution at major evaluation sites will decrease by 77 to 99 percent. It is thus evident that following centralized supply of heat, atmospheric quality will be markedly better than from decentralized heating.

4. Rational use of energy resources and change in the composition of urban fuel. Fundamental control of atmospheric pollution in Lanzhou requires mostly a change in the present use of coal as the principal fuel. Direct burning of coal not only produces a low heat utilization rate (only 15 percent), but it emits all sorts of toxic substances. Practice has shown that use of coal gas for energy by urban residents would be the most effective method of changing the urban energy structure to protect the environment. Coal gasification could convert low quality coal, including low grade lignite and high sulfur-content coal, into a clean gaseous fuel with a 40 percent total heat energy utilization rate. In order to solve Lanzhou's serious atmospheric pollution problems, it has been decided that, following national approval, a coal gas manufacturing plant will be built. That plant will have a daily production capacity of 500,000 standard cubic meters of coal gas, 70 percent of which will be used as cooking gas for 540,000 city residents, the remainder being supplied to some plants for use in production. After that facility goes into production, the low atmosphere coal smoke pollution problem in the city caused by the burning of coal will be virtually eliminated.

5. Continued strict control over all sources of pollution, strict observance of laws, and strict control. The changing of boilers and stoves, the elimination of smoke and dust, and centralized supply of heat are major measures for reducing sources of pollution and decreasing atmospheric pollution. While devoting attention to long-range planning and making major reforms, it is also necessary to pay attention to effective short-term measures. By 1981, 71 percent of the 2,071 boilers throughout the city were effectively brought under control and more than 10 sites for the supply of heat in common newly built. Arrangements were also actively made for bringing in low-sulfur anthracite coal for use as fuel in the city's 150,000 small heating stoves. Even stricter requirements and control within a limited period of time will be required for some of the large petroleum and chemical plants, the oil refineries, and the thermal power generating plants within the city that are major

sources of pollution. In recent years, projects for control of these major polluters has advanced fairly rapidly and results have been striking. For example, nitric acid exhaust gases from the Lanzhou Chemical Company, which were termed "yellow dragons," seriously polluted the Xigu District atmosphere for a long time. In 1981, following construction of a treatment facility, discharge of NO_x , fell from 970 kilograms per hour to 160 kilograms, which was lower than the national standard for virtual elimination of the "yellow dragons." In conjunction with control of all sources of pollution, it is also necessary to devote diligent attention to environmental legislation and the formulation of standards for the atmospheric environment, to monitor atmospheric quality and discharges from sources of pollution; and to forcibly curb the discharge of pollutants in excess of standards.

6. Organization of scientific research to tackle key problems to control photochemical smog. Photochemical smog is a form of atmospheric pollution that is fairly difficult to prevent and control. Furthermore, the complexity of sources of pollution in the Lanzhou area, the topography, and the distinctive meteorological conditions increase difficulties in prevention and control of photochemical smog in that region. In order to control this form of pollution effectively and as quickly as possible, the Chinese Environmental Sciences Institute and the Gansu Provincial Environmental Protection Bureau have jointly organized seven units inside and outside the province for research on key problems. Using a combination of on-site atmospheric chemical and physical methods, they have simultaneously conducted coordinated sampling and monitoring at many sites on many parameters in the study of the patterns of distribution, movement, scattering and transformation of major pollutants. They have set up atmospheric quality simulations in that area that have enabled them to supply scientific data for formulating atmospheric environmental standards for the area, for comprehensive prevention and control of the area's photochemical smog pollution, for industrial development plans, and for monitoring and forecasting atmospheric pollution.

7. More growing of greenery in the city to protect the atmospheric environment. The Lanzhou urban area has a total of about 80 hectares of greenery, an average of only 0.98 square meters per person. It has been calculated that when a city's wooded area averages 10 square meters per capita (or 50 square meters of grasslands), the freshness of the air can be maintained. Lanzhou is a long way from meeting this requirement for greenery and future efforts will be required to intensify the greening of the city, particularly increasing the greening of the two mountains to the south and north of the city to turn them into forests as quickly as possible. This will function not only to purify the air, but will also help block the urban areas' air inversion. Additionally, special attention should be devoted to the greening of industrial areas, and the planting in industrial areas of more tree varieties that are strongly able to absorb toxic gases.

FOOTNOTES

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9432

CSO: 5000/4178

IMPACT OF INCREASED COAL CONSUMPTION ON AIR QUALITY STUDIED

Dalian HUANJING KEXUE XUEBAO [ACTA SCIENTIAE CIRCUMSTANTIAE] in Chinese
No 4, Dec 82 pp 329-340

[Article by Su Weihai [5685 4850 3466], et.al., of the Environmental Chemistry Institute of the Chinese Academy of Sciences, and Yuan Jiwen [5913 4764 2429], Zheng Xuehai [6774 1331 3189], Shen Shizhen [3088 1102 3791] of the Tianjin Environmental Protection Monitoring Station: "A Study of Air Pollution and Aerosol Sulfate in the Region of Tianjin"]

[Summary] From 1980 to 1981, we simultaneously monitored the concentration of atmospheric pollutants and studied air pollution in Tianjin City, the process of the conversion of sulfur dioxide into sulfate and its effect upon visibility. We used the method of the sum of probabilities higher than C_i to process the data. The results of the study show that atmospheric pollution is most serious in the morning, less serious in the evening and moderate at noon. Pollution is more serious in winter than in summer. Among the pollutants, sulfate affects visibility the greatest, followed by the total sum of particles. When the relative humidity is greater than 70 percent, their effect upon visibility is more outstanding. Benzene solutes in particles have a definite effect on visibility. When the relative humidity in the city is high, the concentration of sulfates is high, and this may be the cause of smog in winter. The ratio between the concentration of sulfate radicals and the concentration of sulfur dioxide in the downwind direction, and the value of the ratio between the concentration of sulfur in sulfate radicals and the total concentration of sulfur in the atmosphere are higher than the corresponding values in the upwind direction. This shows that smoke from burning coal in the city is the source of sulfate. The coefficient of correlation between the concentration of sulfate radicals and the concentration of sulfur dioxide in the city is 0.77, the coefficient of correlation between the concentration of sulfate radicals and the concentration of particles is 0.95. The concentration of sulfur dioxide and particles may contribute to the formation of sulfate radicals. The reaction rate constant of conversion of sulfur dioxide to sulfate radicals estimated by the simplified one dimensional active model is about 2.3 ± 1.1 percent per hour, and about 1.5 percent per hour in winter. The distance of transport of sulfur dioxide is about 17 to 340 kilometers.

Table 1. Sum of probabilities of air pollutant concentrations higher than air quality standards

	Particulate matter	SO ₂	NO _x	SO ₄ ⁻ *	
Tertiary standards	0.5	0.25	0.15	20	30
Daily averages	mg/m ³	mg/m ³	mg/m ³	μg/m ³	μg/m ³
I 1980.7					
City	17.5	6.0	--	21.4	9.8
Suburb	2.9	3.6	--	6.98	2.4
City at 08 hours	33.6	11	--	24.4	8.6
City at 12 hours	18.7	11	--	--	--
City at 17 hours	12	5.0	--	--	--
II 1980.9					
City	30.5	10	13.1	12.9	2.35
Suburb	--	--	--	--	--
City at 08 hours	52.4	9.5	12.0	19.5	0
City at 12 hours	21.6	8.8	15.7	5.6	0
City at 17 hours	39	12	10.8	20.5	4.6
III 1980.12					
City	66.1	54	17.8	49	27.1
Suburb	17.8	11.9	4.2	20	6.7
City at 08 hours	85.5	80.7	26.6	77.2	49.5
City at 12 hours	44.9	51.5	9.0	24.5	14.5
City at 17 hours	60.6	65.5	14.5	52	20.2
IV 1981.3					
City	47.8	22	--	40.5	18
Suburb	--	--	--	--	--
City at 08 hours	53.3	34.2	--	59.9	23.1
City at 12 hours	42.9	13	--	31.8	0
City at 17 hours	50.5	34	--	58	32.8

* SO₄⁻ There is no official standard

Table 2. Correlation coefficients (γ) of light-scattering coefficients (b_{scat}) with air pollutant concentrations and relative humidity

July 1980		Total particles	SO_4^-	Relative humidity	Benzene solutes
City	08 hours	0.871	0.874	0.414	--
Eastern suburb	08 hours	--	0.72	0.411	--
	14 hours	0.806	--	0.859	--
	20 hours	--	0.864	0.773	--
December 1980					
City		0.817	0.887	0.427	0.55
Eastern suburb	08 hours	0.698	0.55	0.813	0.81
	14 hours	0.464	0.738	0.52	

Table 3. Correlation data of light-scattering coefficient (b_{scat}) with air pollutant concentrations and relative humidity in the city

x	Particulate matter	SO_4^-	SO_2	NO_x	Relative humidity	Benzene solutes
1980.7						
a	3.4×10^{-1}	2.6×10^{-1}	--	--	6.1×10^{-2}	--
b	2.7×10^{-4}	1.0×10^{-2}	--	--	5.0×10^{-3}	--
r	0.871	0.874	--	--	0.414	--
1980.12						
a	7.5×10^{-2}	3.5×10^{-3}	8.7×10^{-1}	4.08×10^{-1}	3.3×10^{-2}	6.5×10^{-1}
b	5.6×10^{-4}	1.7×10^{-2}	4.7×10^{-5}	8×10^{-6}	8.1×10^{-3}	2.3×10^{-3}
r	0.817	.38	0.379	0.203	0.427	0.55

9296

CSO: 5000/4124

PROPOSALS TO IMPROVE JINAN'S AIR POLLUTION SUGGESTED

Jinan DAZHONG RIBAO in Chinese 25 Apr 83 p 2

/Text/ Engineer and representative Wang Huifeng /3769 5069 7364/, deputy bureau chief of the Jinan Environmental Protection Bureau, in addressing a subcommittee, raised the point that Jinan has severe air pollution which should receive much more attention.

Representative Wang said that with the development of the nation's economy and society, environmental protection work has been handled very poorly, and that it will directly affect the personal, immediate interests of each citizen, and will affect the progress of the four modernizations. And as for Jinan's air pollution, the problem is already rather severe. In the last few years, we have regularly monitored specific sites. The falling dust, suspended particulate matter, sulphur dioxide, carbon monoxide, and other pollutants exceed the national standard, and there is an obvious trend toward the increase of pollution. This situation is quite inappropriate to the position and role of the provincial capital.

Representative Wang Yaofeng said Jinan's air pollution is produced primarily by the combustion of fuel, particularly coal. According to statistics, the ratio of coal ash is about 83 percent, higher than the national average, and higher than that of several northern cities, such as Shenyang and Beijing. Therefore, to improve the air quality and prevent air pollution, while controlling industrial pollution, we must travel many routes to control and reduce waste gas emissions from burning fuel. Representative Wang proposed: 1. Improve fuel composition. Acting Governor Liang put the Jinan Municipal Gas Works in the Sixth 5-Year Plan, this is absolutely necessary. I hope that concerned departments will adopt positive measures, and concentrate their strength on construction, and strive to put it into production at an early date, increase the gasification rate, and thus change the backward situation of mainly burning coal. 2. Actively promote centralized heating. In areas where small, heat-inefficient boilers are concentrated, neighboring units whose boilers have surplus heat, and power plants which are not far from enterprises and cities and which generate a lot of surplus heat, should all develop their potential for centralized heating. For example, the installed capacity of the Huangtai Power Plant is great and there is a lot of surplus heat. It has the right conditions for supplying heat to urban areas. I hope that concerned departments will carry out a feasibility study as soon as possible, and put forward an implementation plan. 3. Emphasize the conversion of various kinds of boilers to eliminate dust and smoke, and thus reduce the amount of smoke and dust in the air.

SHORT-TERM ACID RAIN RESEARCH PLAN IMPLEMENTED

Shanghai JIEFANG RIBAO in Chinese 6 Apr 83 p 2

[Article by Yi Qing [0001 3237]: "Shanghai Draws Up a Short-Term Acid Rain Research Plan To Provide a Theoretical Basis for the Control of Acid Rain"]

[Text] To take action against the phenomenon of acid rain experienced year after year in the Shanghai area, the Shanghai Institute for Scientific Research in Environmental Protection has drawn up a short-term research plan to study the acid rain problem. This research will provide the theoretical basis for future control and regulation of the acid rain problem in this municipality.

Acid rain is a new phenomenon in environmental pollution; it is now occurring in many countries of the world. The chemical compounds formed by sulfur dioxide and nitrogen oxide, given off by coal and oil combustion, after undergoing further chemical reactions and combining with other substances, turn into sulphate and nitric acid, and as a result, rain and snow become acidic. Acid rain is damaging, to varying degrees, to fish, crops, forests, buildings, metallic materials, etc. The problem of acid rain is now acknowledged as one of the major problems of environmental pollution that mankind has to face in the 1980's.

In recent years, monitoring by the environmental departments in Shanghai has revealed that the three counties of Songjiang, Qingpu and Shanghai have comparatively high degrees of acid rain, that the area of acid rain is expanding and furthermore, that the level of acidity tends to increase. According to statistics, Shanghai annually discharges about 300,000 tons of sulfur dioxide and 140,000 tons of nitrogen compounds into the air. Now that more and more coal is burned, if no prompt and effective measures are taken to control the situation, there will be no end of trouble in the future. The short-term research plan of the Shanghai Institute for Scientific Research in Environmental Protection will be extended in the future to include the study of the sources, the mechanics and effects of acid rain and counter-measures to control it.

9808

CSO: 5000/4158

RELATIONSHIP BETWEEN ELEMENTAL CONCENTRATION OF AEROSOL AND METEOROLOGICAL
CONDITIONS IN BEIJING

Beijing DAQI KEXUE [SCIENTIA ATMOSPHERICA SINICA] in Chinese No 2, Jun 83
pp 153-161

[Article by Zhao Deshan [6392 1795 1472] and Hong Zhongxiang [3163 6988 4382],
of Research Institute of Atmospheric Physics Chinese Academy of Sciences]

[Summary] Elemental concentration of atmospheric aerosol and various meteorological conditions in Beijing are observed and analyzed simultaneously to confirm the fact that urban air pollution is closely related to the direction and velocity of the wind, the precipitation, the degree of atmospheric stability, and the near surface inversion. In the winter and spring season, following the passing of a cold front, a period of clear days usually appears with a strong north wind. On the other hand, a period of heavy pollution will occur in Beijing, if after the passing of a cold front the upper atmosphere is under the control of a slow moving anticyclone, the inversion below 300m persists night and day, and the near surface wind field is unfavorable for horizontal transfer. The observations were carried out in a northern suburb of Beijing from 6 to 20 March 1980, using a continuous sampling instrument provided by the University of Florida, United States. The chemical elements of aerosol were determined with the PIXE method by the same university. The observed data are included in the paper in some detail.

6248

CSO: 4009/212

HEAVY METAL POLLUTION OF IRRIGATED AREAS, CONTROL MEASURES STUDIED

Beijing HUANJING KEXUE [JOURNAL OF ENVIRONMENTAL SCIENCE] in Chinese No 6, 1982 pp 7-10

[Article by Zhang Xuexun [1728 1331 6104], Wu Yanyu [0702 3601 3768], Chen Tao [7115 3447], Kong Qingxin [1313 1987 2450], Wang Lianping [3769 6647 1627], Song Shenghuan [1345 0524 3562] of the Forestry and Soil Research Institute of the Chinese Academy of Sciences: "Migration and Distribution Patterns of Heavy Metals Such as Cadmium and Lead in the Zhangshi Irrigated Area and the Way To Control Pollution"]

[Excerpts] The Zhangshi irrigated area is located in the western suburbs of Shenyang City; it is a paddy rice plantation. The area irrigated with sewage water is 42,000 mu, sewage irrigation has been used for 15 to 25 years. Cadmium and other heavy metals have accumulated in the soil, contaminating the crops to varying degrees.

The irrigation canal is 12 kilometers long, and is connected to the open canal of the city's sewer system. The volume of flow is 3.4 to 4.0 cubic meters per second. From May to September during the growing season, the flow combines with the 1.0 to 2.0 cubic meters per second flow of the water in the Huh He. This water is then channeled by the irrigation canal to the fields for irrigation, in autumn, the water drains into the Xi He. The contents of heavy metals in the irrigation water are shown in Table 1.

Table 1. Content of heavy metals in the irrigation water of the Zhangshi irrigated area
Unit: ppm

Item	pH	Cadmium	Lead	Copper	Zinc
Content					
Average content	6.3	0.037	0.119	0.19	2.5
Quality standards of water for irrigation	5.5-8.0	0.005	0.1	0.1	3.0

According to measurement of heavy metals in the water taken in 1977-79, the range of variation was 10-40 ppb for cadmium, 80-300 ppb for lead, 0.1-0.5 ppm

for copper, and 1-7 ppm for zinc. The variation of cadmium in the sewage between years was greater, there was a visible drop. In 1980, it dropped to about 10 ppb, exceeding the water quality standards for irrigation by only one-fold.

Farmland irrigated with sewage water is mostly distributed on the beaches of the Hun He and Gao He and the first terrace land. The soil is meadow paddy soil with a slightly acidic reaction, the tilling layer has an organic content of 1 to 2 percent. Under conditions of irrigation with sewage water, heavy metals easily accumulate in the soil and their activity can be strengthened. Therefore, we must study the migration and distribution of cadmium, lead and other heavy metals in the sewage irrigated area and understand their interaction in the environment before we can implement effective prevention and control measures.

I. Migration and Distribution of Heavy Metals in the Soil of Sewage Irrigated Farmland

The migration of heavy metals in sewage irrigated areas is mainly the result of the movement of water, and the metals concentrate and disperse under different topographic conditions. The distribution of heavy metals in this flat region follows a definite pattern. Generally, the content is higher at the upper reaches of the irrigation canal, where the number of years of sewage irrigation is longer. The content gradually decreases from the beginning of the irrigation canal to the end of the irrigation canal where fields are irrigated with sewage water from the same canal year after year. In some areas because of the difference in the viscosity of the soil and sand, the distribution is uneven.

Results of measurements of heavy metals in the region from 1978 to 1979 showed that in the Yizha and Erzha areas, the average content of cadmium was 5 to 7 ppm, higher than that in the control area by over 30 times. It was about 3 ppm in the Erzha area, 17 times over that in the control area. In the downstream Desheng and Shaling areas, it was only about 1 ppm, slightly higher than in the control area. The distribution of the contents of other heavy metals also showed similar trends. But among the three areas, the soil texture was uneven, the variation in content was great, and this was especially obvious for lead.

Within small areas of the fields, the contents of heavy metals were uneven. The distribution characteristics were: The content was high along outlets of irrigation water where there were more sediments. The content was lower at the center, the soil of the embankments in the fields had a higher content. Therefore, pollution of this region by heavy metals is widespread.

When sewage water enters the paddy fields, suspended substances settle on the surface of the soil in stationary water. The various types of metallic ions in the water and organic-inorganic colloids in the soil undergo absorption and exchange, leaving most of the cadmium, lead, copper and zinc in the tilling layer.

The retention rate reaches over 80 percent. Even after long periods of sewage irrigation, little is leached downward, thus the tilling layer becomes concentrated with heavy metals.

The soil in the irrigated area shows a slight acidic reaction; the soil has been irrigated for many years by slightly acidic water, and the soil has acidified. This increases the content of soluble heavy metals in the soil. The content of soluble cadmium is the highest, approaching over 80 percent. The content of soluble lead is slightly lower than cadmium and the contents of copper and zinc constitute 44.4 percent and 26.1 percent of the total amounts respectively. It can be seen that the forms of cadmium and lead in the soil of this area are mostly effective which can be absorbed by plants.

Table 2. Distribution of cadmium in the soil of paddy fields Unit: ppm

Content at different positions	Outlet 1	Center	Outlet 2	Earth dike
Sampling points				
Yangshi	5.22	4.75	5.88	4.30
Zhangshi	4.80	2.60	4.30	6.30
Yuguan	0.56	0.40	0.63	0.25
Deshengyingzi	0.45	0.34	0.60	0.82

Table 3. The relationship (ppm) between the total amounts of heavy metals in the soil and the soluble states (0.1NHCl).

Item Type	Cadmium	Lead	Copper	Zinc
Total amount	5.20	70.4	66.3	270.8
Soluble states	4.40	58.2	29.6	70.1
Soluble states as a percentage of the total	86.5	82.1	44.4	26.1

II. Content and Distribution of Heavy Metals in Crops

The main crop of the irrigated area is paddy rice. Soybean is interplanted along the embankments in the fields. Some parts of the paddy fields have been changed to vegetable fields and corn fields.

The absorption and distribution of cadmium in various parts of the crops show roots > leaves on stem > empty glume > seeds. The total amount absorbed by each type of plants show sunflower > corn > paddy rice > soybean. A comparison of the content in the seeds show soybean > sunflower > paddy rice > corn.

Vegetables and tobacco have been planted in the soil of paddy fields with the same content of heavy metals. Although the fields are irrigated with clean water now, the content of heavy metals in the edible parts of various types of vegetables show visible differences. The content of cadmium in tobacco is the most noticeable, more than 100 times that in the tobacco planted in the area irrigated with clean water. In vegetables, green vegetables have the highest content followed by fruits; root vegetables and string beans do not show a visible content. For example, the content of cadmium in fresh green vegetables is 0.8 to 0.3 milligrams per kilogram.

The contents of different heavy metallic elements vary greatly in cultivated paddy rice (See Table 4). Cadmium is easily absorbed by paddy rice and it is transferred to the seeds and enters the food chain. But paddy rice has a lower absorption rate for lead, and under ordinary conditions, copper and zinc are trace elements necessary to the growth of plants.

The soil of this area shows a slight acidic reaction. The soluble amount of cadmium and the content of cadmium in rice show a definite relationship.

Table 4. Content of heavy metals in the soil and in coarse rice Unit: ppm

Location	Cd		Pb		Cu		Zn	
	Soil	Coarse Rice	Soil	Coarse rice	Soil	Coarse rice	Soil	Coarse rice
Yizha	6.89	0.76	94.0	0.38	96.8	2.40	85.3	17.8
Erzha	5.13	0.22	74.5	0.84	70.0	1.18	83.1	16.8
Sanzha	4.85	0.14	101.1	0.38	72.3	2.55	72.5	21.5
Shaling	0.83	0.07	29.7	0.23	27.0	1.25	57.1	17.9

Statistics show that when the content of cadmium in soil is between 2 and 5 ppm, rice with a content of 0.4 ppm of cadmium is easily produced. When the content of cadmium in the soil is over 5 ppm, rice with a content of 1 ppm of cadmium is easily produced. According to Japanese criteria, a region producing coarse rice with a content of 0.4 ppm of cadmium is a contaminated area, and a region producing coarse rice with a content of 1 ppm of cadmium is a severely contaminated area. The Yizha area is severely contaminated and the Erzha and Sanzha areas are mildly contaminated. The downstream Desheng and Shaling regions are slightly contaminated.

The content of lead in the soil is unrelated to the content of lead in rice. The range of variation is great. Generally, the lead entering the soil easily complexes with organic matter. Many plants absorb lead, and most of the lead is concentrated in the roots. The path of entry into the body of plants includes absorption by roots and leaves. In urban and suburban regions, the air frequently contains abundant lead and external pollution is also a factor.

A summary of the above analysis of soil and crops shows that the accumulation of heavy metals in the soil has exceeded that in the control areas by several times or several dozens times. The effect of cadmium is the most obvious. It is mainly concentrated in the middle and upper reaches near the water source of the irrigated area. But the rice and green vegetables produced generally exceed or approach the hygienic standards for food.

Sewage in this area is generally used for closed irrigation. Water drained from the fields is used in cycles. Because the soil is heavy, most of the heavy metals are concentrated in the tilling layer. Most of the heavy metals remain in the soil after irrigation with sewage water and after being absorbed by the crops. Even when clean water is used for irrigation, it will take a long time to reduce the content of heavy metals in the soil to the level of the control areas by letting the crops absorb the heavy metals year after year.

III. Treatment of the Soil in the Sewage Irrigated Areas and Methods of Improvement

At present, the series of problems concerning the eradication of pollution sources in this area, treatment and utilization of sewage and soil improvement urgently needs to be solved. The elimination of pollution sources is the prerequisite to soil improvement. We must adhere to the water quality standards for irrigation, and carry out rational irrigation before we can effectively prevent further pollution of the soil. The treatment of contaminated soil should be carried out in many ways, and mainly by improving subdivisions:

1. Highly concentrated regions: These regions are mainly low-lying areas of sludge deposits that store water. The covering soil used to fill the spaces where silt has been removed along the two banks of the main canal has a content of 40 to 100 ppm of cadmium. At present, this soil should not be used as sludge for fertilization to prevent secondary pollution. New soil can be used for covering and willow trees can be planted. The bottom mud in the spaces where silt has been removed from the main canal can be used to plant *polygonum orientale* and *bidens tripartita* which are superior plants in the area. Their propagation should be expanded and they should be used to reduce the cadmium content by absorption and concentration.
2. Severely contaminated area: The area of this region is about 6,000 mu. There is a long history of sewage irrigation. The cadmium content in the soil is over 5 ppm, and the soil can no longer be used as paddy fields. Other types of non-edible crops can be planted.
3. Areas of medium contamination: This area is about 9,000 mu. The soil contains 2 to 4 ppm of cadmium. Measures for this region should mainly involve the use of lime as soil improvement agent to increase the pH of the soil and to reduce the absorption of cadmium by the crops. The irrigated water quality should be limited to within the quality standards for water for agricultural irrigation. Based on our experiment to improve soil with cadmium

contamination in 1978-79, the application of 150 to 250 jin of lime per mu in medium and heavily contaminated areas where the cadmium content in the soil is 4 to 10 ppm and the content in the irrigated water is 10 ppb, can reduce the content of cadmium in the paddy rice seed to about 0.4 ppm. Application of 150 jin of lime per mu in areas of medium and light contamination where the level of soil contamination is below 4 ppm can reduce the cadmium content in paddy rice seeds to 0.1 ppm. This also suppresses lead.

Because the absorption of cadmium by paddy rice seeds occurs mainly during the latter part of the growth period, especially during the filling period, therefore, after paddy rice panicles have headed, constant irrigation by shallow water to prevent withering can also reduce the absorption of cadmium by paddy rice. The distribution of cadmium in paddy rice plants is mainly concentrated in the roots. After harvesting paddy rice, the roots should be removed and the straws should not be returned to the fields.

4. Areas of slight contamination: The area is over 20,000 mu, the content of cadmium in the soil is about 1 ppm. In this region, we must strictly adhere to the water quality standards for irrigation and irrigate by quotas. At the same time, we should build water conservancy projects well and prevent leakage of major trunk canals and branch canals.

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9296

CSO: 5000/4137

ECOLOGICAL BALANCE OF OFFSHORE FISHING

HK041235 Beijing RENMIN RIBAO in Chinese 30 Jun 83 p 3

[Article by Xu Dixin [6079 3321 2450]: "We Must Pay Serious Attention to the Ecological Balance of Offshore Fishing"]

[Text] A marine ecosystem is a composition of water environment and ecological system. If the water environment undergoes changes, the ecological balance will be affected to various degrees. The effects of the marine ecosystem are very great. Change in the water environment is chiefly dictated by natural factors. However, man-made factors should not be neglected. Some environmental factors, such as water temperature, sea currents, and climate, are affected comparatively little by man-made factors, while other environmental factors may be affected by man-made factors. For example, the drainage of toxic waste water into the sea will lower the quality of the sea water and affect the growth and reproduction of organisms, while applying fertilizers to offshore areas and creating artificial reefs in the waters may create an advantageous environment for the growth and reproduction of organisms. The artificial way of breeding organisms in a suitable place will change the composition of the aquatic ecosystem in the area and increase the aquatic resources.

The pollution of the marine environment by petroleum, heavy metals, and other harmful materials is affecting the development of offshore fishing and is a problem of an international nature. The coastal waters of our country are polluted to various degrees. For example, a volume of 2 billion cubic meters of waste water is draining into the Bohai Gulf, and there has appeared the phenomenon of red tide as a result of the deterioration of the quality of water. Water pollution is especially notable in Dalian Wan, Jinzhou Wan, Bohai Wan, and Laizhou Wan. The water pollution in Dalian Wan has caused the decay of kelp and a decrease in shellfish. There used to be seven offshore fish breeding farms there; now, there is only one left. According to the analysis of investigation and survey materials of departments concerned, pollution control in the offshore environment of our country has achieved certain results--oil pollution in Bohai has tended to slow down and decrease. This is good. However, with the expansion in the scope of marine exploitation, especially the development of the offshore oil industry, the prevention of pollution by oil and other harmful materials will still be an important issue in protecting the offshore environment, especially the ecosystem of the fishing industry.

Irrational coastal civil engineering construction may also lead to the destruction of the ecological balance in the marine environment, destroying grounds for breeding fish and shellfish. Building dykes to reclaim land from marshes with the aim of increasing the production of grain is not without positive effects. However, in some places, because of the lack of fresh water and of construction of complete projects, farming has proved to be impossible long after the closure of the dykes. Where farming is possible, the production of grain has not been ideal. Moreover, irrational construction of dykes to reclaim land will even affect the breeding of aquatic products. For instance, Xiamen Prefecture has reclaimed farmland from the two bays of Xinglin and Muluan. Grain has been cultivated but, for a long time, has failed to recoup the cost. According to investigation a few years ago, the production cost of oysters valued at 100 yuan was less than 10 yuan, the profit being 90 yuan. When the place was changed to cultivate grain, every 100 jin resulted in a loss of 5 yuan. Therefore, it can be seen that building dykes to reclaim farmland from marshes originally suitable for breeding is worth a second thought from an economic point of view.

The ecosystem of fishing waters is an artificial ecosystem. Marine organism (fish) resources are resources of a reproductive nature which are dictated by the law of ecology. If man should disregard the restriction of the objective laws of ecology and do things according to his own subjective will in a one-sided way, the reproduction power of various kinds of fish will be damaged. In old China, a large quantity of marine organism resources went untouched because of low fishing capacity. After liberation, there has been development in the aquatic products industries and fishing capacity has increased with each passing year. However, the phenomenon of overfishing has appeared in recent years. The reproduction power of many kinds of fish has been greatly damaged. For example, the fishing season of hairtail and small yellow croaker in Bohai rarely occurs nowadays as a result of the overfishing in successive years of egg-laying mother fish and young fish. Overfishing has occurred in the East China Sea as well. As mentioned above, pollution of the surface waters along the coast of our country has become a grave problem; though aquatic resources in offshore waters have suffered comparatively small damage, damage caused by fishing have become more and more serious. Fish are being caught whether they are big or small, whether they are mother fish or young fish. The composition of resources has been changing; the tendency is that the traditional, good-quality object of fishing--large fish--is replaced by a newly-risen low-quality object of fishing--small fish--resulting in the formation of a vicious cycle.

Starting from the view of ecological economy, it is imperative to adopt an overall view in giving consideration to the interests of the present and, at the same time, to the interests of the long term. Therefore, it is imperative to correct the subjective view that marine organism resources are "inexhaustible" and the method of "draining the sea to get all the fish" by "exerting efforts in fishing only but not caring for breeding," "getting more from fishing for a netload than breeding for a whole year," and "no rest in summer, no rest in fishing, no slack season, and busier in the busy season." By draining the sea to get all the fish, the resources will dry up "when they are over exploited." It is said that between August

and September 1978, about 1,400 prawn fishing boats were dragging their nets for a month in Bohai; every part of the sea bed had been trawled 33 times on average. Was this not an example of "draining the sea to get all the fish?" And there were the trawls and tight-weave nets that the masses called "nets offering no offsprings," which seriously destroyed economic young fish. In the autumns of 1973 to 1977, when prawns were being caught, 56,652 tons of economic young fish of seven categories were caught at the same time (amounting to 6.5 billion); if those young fish had been caught 2 years later, the amount could have been 300,000 tons. In other words, the catching of the young fish alone cost us the loss of over 300,000 tons of grown fish! This did not increase production but caused damage!

It is necessary to solve the problem of rational exploitation. Of course, it is necessary to suit measures to local conditions. And the requirement for exploitation is that there must be a limitation to it. We are not to blindly pursue high targets. Moreover, it is necessary to persist in the principle of "breeding while exploiting, combining breeding with exploiting." The question of breeding not only includes artificial breeding, but also artificial reproduction. For example, we should leave a sufficient and appropriate quantity of basic resources--broken down into groups--in a planned way, allowing their progeny to live and preserving the intensity of their reproduction for several generations so as to provide an ample material basis for fishing. At the same time, we should not catch young fish and should adopt measures to stop fishing in summer, which proved effective in the past. At present, the proportion between fishing and breeding is nine to one respectively in the offshore fishing industry of our nation. The proportion of breeding is so small that it deserves our attention.

In order to guarantee the breeding undertaking in the coastal and offshore areas, it is necessary to turn to the deep waters in the open sea for development. For reasons of technology and economy and old habitual forces, over the past 20 years--since the 1960's--fishing in the open sea has remained at an experimental stage. No actual results have been gained. Moreover, annual losses have amounted to 10 million yuan. But this does not mean that we should lament our deficiency before the vast ocean. Although there are difficulties in technology and capital in the development of fishing in the open sea at present, we are by no means at our wits end. It is an inevitable tendency to develop from the offshore to the open sea. Some comrades have proposed that we might as well fix the proportion of production of the fishing grounds on the coast, in the offshore, and in the open sea as 2:2:1 respectively. If this is achieved, "a high efficiency-type of fishing industry structure" will be formed. This requires our protracted, strenuous efforts.

CSO: 5000/4183

ELECTROPLATE PLANTS TO REDUCE POISONOUS WASTES

OW070748 Beijing XINHUA in English 0716 GMT 7 Sep 83

[Text] Kunming, 7 September (XINHUA correspondent Qiu Jingdong)--Electroplating factories in 41 Chinese industrial cities including Beijing, Shanghai and Tianjin are being revamped to reduce their discharge of polluted waste liquids, which contain cyanide and other deadly toxic chemicals.

Industrial cities in Liaoning Province, China's leading heavy industry center, are now able to treat 70 percent of electroplating waste water, as against 30 percent in 1981, while the number of electroplating factories was cut from 1,000 to about 500 without affecting the overall capacity.

The electroplating industry in these cities has been streamlined to facilitate the adoption of technology requiring no or less cyanide, according to a national conference which ended in Kunming, capital of southwest China's Yunnan Province, last week.

The national effort to transform electroplating factories began in 1981. Results have been "satisfactory," according to the meeting.

Called by a subdivision of the national network of environmental protection science and technology information, the meeting also examined progress in saving water used for industrial purposes.

Between 60 and 85 percent of water for cooling used in Beijing, Tianjin, Dalian, Qingdao and Shanghai is now being recycled, the meeting reported.

The amount of water saved in Beijing last year was equivalent to the annual output of a water works producing a daily average of 140,000 cubic meters.

CSO: 4010/90

ENTERPRISES ILLEGALLY DISCHARGING WASTES INTO YELLOW SEA, BO HAI

Beijing GONGREN RIBAO in Chinese 4 Apr 83 p 3

[Text] The marine environmental inspection vessel, "Zhongguo Haijian 11," in charge of implementing the Marine Environmental Protection Law of the People's Republic of China recently monitored parts of the Yellow Sea and the Bo Hai. Results indicate that although some preliminary results have been obtained from treatment measures for ocean pollution in recent years, generally speaking, damage to the ocean environment from continuous discharge of large quantities of wastes from land and sea remains very serious. From 1 to 8 March, the "Zhongguo Haijian 11" measured the oil content of the surface seawater, the chemical oxygen consumption, acidity, and dissolved oxygen of areas on Shi Dao and Chengshan Jiao and areas of the Oil Extraction Platform No 7 and the oil drillingship Bohai No 8 of Bohai. The oil content of the seawater near Shi Dao met the State standards but the other three areas exceeded the standard, two, three, and eight times.

When the monitors landed on the Oil Extraction Platform No 7, they discovered that there was no equipment to enclose and reclaim the oil or equipment for chemical analysis. This platform discharges more than 40 m³ of wastewater a day and the oil content of the wastewater greatly exceeds the State standards. Judging from present data, the pollution of the Yellow Sea and Bo Hai has already caused severe damage to the aquatic resources of the bay and the estuaries. Several years ago, Shi Dao produced large quantities of crabs, prawns, and fish. Today, there is almost no trace of them. Pollution of the Dalian Wan, Jinzhou Wan, Bohai Wan, and Laizhou Wan is said to be more conspicuous. Fish are extinct in some places and shoal breeding sites are useless.

According to statistics, there are more than 18,000 plants, mines and enterprises along the shores of the severely polluted Bo Hai and Yellow Sea. Every year, in addition to domestic sewage, 1.73 billion to 2.1 billion tons of industrial wastewater is directly discharged into the coastal waters. There are 31 key plants and mining enterprises that discharge more than 10 million tons each per year. Obviously, the pollution and damage of China's coastal environment is caused mainly by land-based pollutants.

The monitors believe that the Marine Environmental Protection Law does not absolutely prohibit the use of the sea to dispose of wastes but it requires all plants and mining enterprises to follow the specific regulations for waste disposal as stipulated in the law so as to utilize the self-cleansing ability of the ocean scientifically and reasonably.

6248

CSO: 5000/4156

OIL POLLUTION IN THE SOUTH CHINA SEA IS IN URGENT NEED OF CONTROL

Guangdong NANFANG RIBAO in Chinese 24 Mar 83 p 4

[Text] With the development of industrial and agricultural production in Guangdong Province, the South China Sea is being polluted by the "three wastes" more seriously everyday. Oil pollution is especially prominent. According to investigations and monitoring of related units, the oil content of the sea water at the estuarial region of the Zhu Jiang was 0.046 ppm (parts per million) in 1976; by 1982 it increased to 0.107 ppm, a more than one-fold increase, exceeding the water standard for fishery use set by the State (below 0.05 ppm). The oil content of the sea water at many monitoring stations has reached the lethal density for fingerlings, seriously threatening the development of marine fish production.

Oil pollution of the sea causes the natural environment of the seashore to deteriorate and the shore plants to wither and die. Tourist areas along the shore are destroyed. Harbor facilities, coastal buildings, and ships are being damaged. The harm to marine fishery is even greater. When oil pollution incidents occur, shoals of fishes immediately escape from the area and the fishing ground is thus destroyed. The catches cannot be eaten. Because it is difficult for oil to be dissolved in water and oxidation decomposition is very slow, the oil stays in the sea for a long time. Large oil slicks affect the material exchange between the seawater and the atmosphere causing the marine ecological environment to deteriorate and large quantities of organisms to die from oxygen deficiency. It is well-known that oil is toxic to marine life. When the oil density of the seawater reaches 0.1 ppm, planktonic shellfishes begin to die and the newly hatched fingerlings can survive only 1 to 2 days. If the density is high, the organic cells will be damaged and die; if the density is low, the nutritional state of the marine organisms will be disturbed, it will absorb the chemicals which function as an information link among marine animals, causing ecological imbalance and a degeneration of the community of living things. According to the estimate of scientists, after an oil pollution accident, it often takes 5 to 7 years before the propagation of the organisms of that sea area may resume completely, and the long-term damage may not even be known for several tens to a hundred years. The toxic substances in the oil may be absorbed by the marine organisms, are concentrated and enter the food chain. Through economic fishes and shellfishes, the long lasting toxic substances and carcinogens of the petroleum are consumed by man and endanger human health.

In recent years, the aquatic resources of South China Sea have decreased sharply. The quantity of catch is reduced and the dominant species in the fish colony have changed. These facts are closely related to oil pollution of the sea area of the Zhu Jiang Estuary. According to a survey by the Nanhai Research Institute of Marine Products, traces of echinoderms could no longer be found in the sea area of the Zhu Jiang Estuary last year. This should serve as an indication of the seriousness of the situation. If treatment and control measures are not adopted in time, with the development of the petrochemical industry in Guangdong Province and the exploration of oil in the South China Sea, oil pollution certainly will be even more severe.

6248

CSO: 5000/4156

TOTALS OF Zn, Cd, Pb, AND Cu OF NORTHWESTERN BO HAI BAY STUDIED

Beijing HAIYANG XUEBAO [ACTA OCEANOLOGICA SINICA] in Chinese No 3, May 83
pp 292-305

[Article by Liu Mingxing [0491 2494 2502], Bao Wanyou [0545 8001 0645] et al:
"Distribution of States of Zn, Cd, Pb, and Cu in the Northwestern Waters of
Bo Hai Bay"]

[Summary] On 20-25 April 1981, water samples were taken at 11 test stations, starting from the estuary of the Beitanghe southeastward in a region of the bay influenced by the discharges of the five rivers Jiyun, Chaobai, Yongding, Jinzhong, and Haihe. From the shores toward the open sea, the water temperature is found to vary from 8.9 to 16.1°C, pH from 7.52 to 7.97, Eh from 363 to 395 mv, and So/oo from 26.13 to 32.00. Densities (ug/l) of unstable, inorganic-bond, organic-bond, granular, and total Zn, Cd, Pb, and Cu of the water samples are analyzed and reported. Judging from the results, the sediments of the region absorb Cu easily and Pb poorly. The tides are found to have a definite effect on the density of the four metal ions; the distribution of the states of these metals is often in the shape of tongues or bands toward different directions, related, perhaps, to the difference of wind, wave, and tide action. The color and turbidity of the waters change constantly to indicate complex movement of bodies of water in that region.

This paper was received for publication on 6 February 1982.

6248

CSO: 4008/219

CHROMIUM POLLUTION IN BO HAI BAY STUDIED

Beijing HAIYANG XUEBAO [ACTA OCEANOLOGICA SINICA] in Chinese No 2, Mar 83
pp 187-193

[Article by Huang Huarui [7806 5478 3843], and Pang Xuezhong [1690 1331 1813]:
"Distribution and Migration of Chromium in the Surface Seawater of Bo Hai Bay"]

[Summary] This paper reports the results of four surveys by the authors in 1979-1980 to determine the soluble and granular chromium in the seawater of Bo Hai Bay in the course of investigating the condition of land-based chromium pollution of that bay which is an affluent site of sewage and industrial wastewater from the cities of Beijing and Tianjin. The chromium contents are found to decrease from the inshore and the estuaries toward the open sea. The density gradient of the estuary appears to be related to the salinity of the seawater and the chromium content of the sediments. Granular chromium is in direct proportion to COD, indicating a strong binding capacity of the organic matter and the chromium in the seawater, perhaps an important factor of chromium migration. The ratio of granular chromium in the total chromium is very high, above 90 percent at the estuaries; therefore, granular chromium is the major state of chromium in the Bo Hai Bay. The test method and the resultant data are reported in some detail.

6248

CSO: 4009/178

BRIEFS

PREVENTING CHROMIUM POLLUTION--The Beijing Municipal Water Conservancy Survey and Design Institute has been successful in helping Liaoning's Jinzhou Ferroalloy Plant to prevent chromium waste pollution by using the first underground anti-seepage wall in China. On 8 April, the concerned units appraised, checked and then accepted the project. This achievement opens a new path in the nation's control of environmental pollution. In early 1980, the Beijing Municipal Water Conservancy Survey Design Institute undertook the job of creating the research design and coordinating the construction work for handling chromium waste pollution. Scientific and technical personnel carried out a survey and proposed using an anti-seepage wall to prevent chromium pollution. The Beijing Municipal Water Conservancy Survey Design Institute organized a team and was responsible for the construction. This team built an anti-seepage wall totaling 800 meters, cast completely of clay and concrete. In tests, all major technical norms met design requirements. [Text] [Shijiazhuang HEBEI RIBAO in Chinese 12 Apr 83 p 3] 12452

JINZHOU HALTS CHROMIUM POLLUTION--A project to prevent chromium pollution long awaited by the people of Jinzhou--an anti-seepage wall to prevent chromium pollution at the Jinzhou Ferroalloy Plant--is now complete. It was checked and accepted in early April and the results are evident. Chromium waste pollution was a great menace and danger for all the people of the city. The toxic elements in the chromium waste seeped into the ground through rain showers and severely contaminated the soil and groundwater. The contaminated area has reached 15 to 20 square km. The newly constructed anti-seepage wall is 800 meters long, over 10 meters deep and .7 meters thick. It seals off the chromium waste accumulated in the soil in an underground basin made of rock and the anti-seepage wall. It has effectively stopped chromium containing water from seeping out and has prevented the contamination of the groundwater flowing under and outside the wall. Recently, it was found through testing that the toxic six-valence chromium elements in the well water in two wells outside the wall have already decreased from a level of 60 to 80 mg per liter before construction of the wall to 2 mg per liter. [Liu Weilin [0495 3634 2651] [Text] [Shenyang LIAONING RIBAO in Chinese 18 Apr 83 p 1] 12452

CSO: 5000/4174

POLLUTION SURVEY IN FUJIAN CONDUCTED, MAJOR PROBLEMS OUTLINED

Fuzhou FUJIAN RIBAO in Chinese 9 Jun 83 p 3

/Article by Lin Zhen /2651 3914/ and Qiu Tingjie /6726 1694 0267/: "The Provincial Survey on Sources of Pollution Ends; Three Important Points on Environmental Protection Are Emphasized: Strengthen the Supervision and Management of the 'Three Wastes' Discharged by Small-Scale Enterprises; Set Up a Monitoring Network along the Min Jiang and the Jiulong Jiang; Control the Application of Pesticide and Forest Felling"/

/Text/ The provincial survey on sources of pollution has ended, providing first-hand data to draw up environmental protection plans.

This is the largest comprehensive environmental survey in Fujian Province since the founding of the nation. Begun in April of last year, the survey has taken 1 year. Over 2,000 units and 2,600 persons took part in the survey, the survey covered the current pollution and treatment situation in industry, transportation, medical and public health facilities and domestic life. Altogether, 2,407 units were investigated (2,209 were industrial enterprises and 198 were medical and public health facilities) more than 320,000 bits of data were collected. We basically know the amount of waste water, industrial residue, particulate matter, toxic and hazardous gases and other pollutants discharged in this province in the past few years; and key polluted areas, industries, enterprises and water systems have been found. Areas that need to be treated in the industrial system of this province during the period of the Sixth 5-Year Plan, have been defined, funds and economic results have been estimated.

Judged by the survey, the following issues are worth paying attention to:

1. The volume of the "three wastes" discharged by small-scale enterprises run by the county, and communes and brigades is over 50 percent of the total discharged in the province, and these enterprises are widely dispersed; therefore, it is imperative to strengthen the organs of environmental protection at the county level for the supervision and management of small-scale enterprises.
2. Inland waterways are seriously polluted. Seventy-four percent of industrial effluent in the province is discharged into the Min Jiang and the Jiulong Jiang. We need to set up environmental monitoring points and networks along these two rivers.

3. Excessive application of pesticides. The average amount of pesticide applied per mu is several times, even scores of times, higher than developed countries, contaminating water sources, farmland and food. The overfelling of forests causes frequent drought and flooding, and affects the ecological balance and industrial pollution has caused agricultural losses.

12272

CS0: 4008/155

HEBEI'S CAPITAL ADOPTS POLLUTION CONTROL SCHEME

OW091229 Beijing XINHUA in English 1107 GMT 9 Sep 83

[Text] Shijiazhuang, September 9 (XINHUA) -- Shijiazhuang, a rising industrial city in north China, has closed a number of electroplating factories and renovated 200 soot laden chimneys in a drive to control pollution.

In addition, the city, capital of Hebei Province, has ordered the farm chemicals factory to move out of the city and 14 other factories to build antipollution treatment plants.

The move was made following a two-year environmental pollution survey of the air, underground water, surface water, food supplies and noise.

The survey showed that this medium-sized city with a population of about one million had serious problems. The more than 500 industrial enterprises there had a daily discharge of 730,000 tons of liquid waste, 120 million cubic meters of gas waste and 2,000 tons of solid waste. This caused pollution to water both above and underground. The noise level, caused mostly by trains and vehicular traffic, far surpassed normal standards for cities. Air pollution was most serious during winter when every household burns coal for heating.

To prevent further deterioration of this situation, the city, upon the advice of the survey team, adopted measures to control the city sprawl and worked out an overall plan for pollution control and municipal construction.

Now an environment monitoring network has been set up in the city. A pilot project has been launched to popularize central heating and reduce the number of boilers. Earlier this year, the city launched a beautification campaign which added 120 hectares of green cover to the city proper.

CSO: 4010/91

ZHEJIANG'S HANGZHOU CLOSES SHOPS TO FIGHT POLLUTION

OW060900 Beijing XINHUA in English 0827 GMT 6 Sep 83

[Text] Hangzhou, September 6 (XINHUA correspondent Tong Baogen) -- Pollutant-discharging industrial workshops round the picturesque West Lake, one of China's best known scenic spots, have been closed down to create a better environment on the orders of the municipal government of Hangzhou.

The 85 workshops involved include electroplating workshops, heat-treatment workshops and foundries that used to discharge dust and poisonous gas, according to a spokesman for the municipal government.

Similar workshops in the heart of the city have also been closed down. Workers have been transferred to new jobs, the spokesman said.

Earlier this year, the State Council instructed Hangzhou City to concentrate on expanding tourism and industries servicing it. The State Council called for intensified efforts to protect the West Lake and the surrounding scenic spots and places of historical interest.

CSO: 4010/91

ZIGONG TAKES MEASURES TO CONTROL SEWAGE

Chengdu SICHUAN RIBAO in Chinese 6 Apr 83 p 2

[Article: "Zigong City Obtains Preliminary Results in Sewage Control"]

[Text] By means of combining evaluation and selection of "clean plants" with economic sanctions, Zigong City obtained preliminary results in sewage control.

Zigong's salt and chemical industrial plants, which are fairly packed together, consume an enormous amount of water. The water of the Fiqu River, the only river in the urban area, is very high in chloride content, and sometimes unfit for crop irrigation. In 1978, the city was forced to bring drinking water in from the Hulukou reservoir and Weiyuan river over a distance of 74 km. For this reason, the city, in 1979, launched activities to build "clean plants to protect the environment." The city government set up specific standards, and every year, the departments concerned were organized to make inspections before acceptance and jointly evaluate the results. The city government, after examination and approval, made the nominations. In the past 3 years, 18 enterprises were named "clean plants."

At the same time, the city adopted the method of collecting fees for waste, thereby propelling the conversion of the backward units. Based on the amount and density of the waste substances discharged by the plants and mines, they set up different fee standards and specified a time limit for correction. When a problem is not solved in 1 year, the fee is doubled. After the offending units have instituted reliable technical measures to eliminate pollution, the city refunds 80 percent of the fee collected for use as a special fund for handling the "three wastes." Two years ago, the Honghe chemical industrial general plant was charged 160,000 yuan in fees for waste discharge, but last year the amount dropped to 60,000 plus yuan. According to incomplete statistics, since 1976, the city launched 212 waste control projects, at an investment of over 20 million yuan.

The method of combining the evaluation and selection of "clean plants" with economic sanctions^s has promoted and reinforced the control of the "three wastes" by the plants and mines throughout the city. Sewage discharge has decreased year after year, the water of the Fuqi River has gradually cleared up and fish have returned.

6080

CSO: 5000/4173

CONSIDERABLE REDUCTION IN GANSU PROVINCE'S POLLUTION REPORTED

Lanzhou GANSU RIBAO in Chinese 12 Mar 83 p 1

[Article by Kuang Daan [0562 1129 1344] and Zhao Weimin [6392 0251 3046]: "Results Achieved in Pollution Control. Striking Reduction in Three Wastes. Lanzhou Petroleum Refinery Gives Serious Attention to Environmental Protection"]

[Text] As a result of provincial and municipal environmental protection departments' checking and approval, as of 1 September 1982 the Lanzhou Petroleum Refinery stopped paying fees for discharge of pollution for industrial waste water treated by its waste water treatment plant. This is the first such case in the province.

Formerly the Lanzhou Petroleum Refinery annually discharged more than 9 million tons of waste water into the Huang He River. This waste water contained large quantities of oil, sulfides, phenol and other toxic substances. Since 1974, while vigorously developing production, this plant has reformed technology in a series of ways, has strengthened management, and has eliminated the running, venting, dripping, and leaking of wastes. It has also used more than 16 million yuan to complete more than 30 environmental protection projects. The refinery area's environment has consequently improved greatly and the discharge of waste water, waste gas, and waste residues has declined strikingly. After the provincial government promulgated trial regulations on collection of fees for discharge of wastes in excess of standards, the Lanzhou Petroleum Refinery further strengthened its environmental management. It set up economic management methods within the refinery for the discharge of wastes. Every workshop, every set of equipment, and even every waste discharge outlet had to be inspected, and limits were set on the discharge of wastes. As a result, the volume of industrial waste water fell from 1,200 tons to 600 tons per hour, and the average oil content of waste water going into the waste water plant fell by 88.3 percent. In April 1981, three stage activated carbon treatment equipment with a capacity to treat 500 tons per hour was installed. After it was formally put into operation, the formerly murky black and stink-

ing water became clear, transparent, and odorless. The concentration of all toxic substances became not only lower than national standards for effluent, but also approximated or attained national standards for surface water quality. More than 30 percent is now recovered for re-use.

Beginning 1 September 1982, provincial and municipal environmental protection departments acted in accordance with pertinent regulations to halt the levying of fees for the discharge of polluted water.

9432

CSO:5000/4150

LANZHOU IMPLEMENTS MEASURES TO CRACK DOWN ON POLLUTERS

Lanzhou LANZHOU BAO in Chinese 19 Oct 82 p 4

[Text] The People's Governments of all counties and districts, all municipal departments, all units subordinate to the city, all units in Lanzhou City subordinate to the central and provincial governments, and all troops stationed in Lanzhou:

In order to conscientiously carry out the "Provisional Measures to Levy Pollution Charges," issued by the State Council, the following is hereby decreed with respect to related problems and in accordance with the spirit of the provincial government's "Notice on Conscientiously Carrying Out the Provisional Measures to Levy Pollution Charges" and that of the provincial Bureau of Environmental Protection "Notice on regulations to levy pollution charges":

1. Levying pollution charges is an important measure to strengthen environmental management, to promote a strong administration and management of enterprises and businesses, and to conserve and comprehensively utilize resources. It is an effective method for controlling pollution and improving the environment. The People's Governments of all counties and prefectures, and related departments should strengthen the leadership of this work and start collecting fees step by step and in a planned manner. On 15 November of this year we will start collecting charges for smoke and dust emitted by industrial and heating furnaces.
2. The Lanzhou Municipal Environmental Protection Office will organize in a unified manner the work of levying pollution charges. The effluent fees for enterprises and businesses above the municipal level are to be handled by the municipal Environmental Protection Office; the task of collecting fees from all other units are to be managed by county and district environmental protection offices.
3. The polluting units should strengthen the management of pollutant discharge and proceed with periodic or unscheduled monitoring and analysis so as to report the actual types, density, and quantity of pollutants being discharged, according to the regulation of the collection department and to fill in the respective "effluent discharge report table," wastegas discharge table, smoke and dust from production and waste residue tables to be delivered to the collection department.

4. The department in charge of collecting pollution fees, the designated or commissioned monitoring unit will determine the unit that is to test the pollutants, the specific method of determination and the instrument, the method of weighing and calculating materials, the Ringelmann density chart colorimetry, etc. on the basis of the types of pollutants, the forms of discharge, and the technical conditions. All those using instrumental technique of determination, implementing the "Unified Monitoring and Analysis Method for Pollution Sources" printed and distributed by the China Environmental Monitoring Central Station, and have not installed measuring equipment, will be charged 70 percent of the amount of effluent discharged.

5. The collection department should seriously examine the reports of the discharging units, inspect the actual types, density, and quantity of the pollutants to calculate and determine the amount of the levies. The amount of the levy is generally to be examined and determined once a year. If there is an obvious change in the pollution condition or pollution has increased, the discharge unit should report to the collection department on time, and after examination and inspection, a new amount should be determined. Individual units that discharge a large quantity of pollutants or have the capability to monitor themselves should discuss with the collection department the specific methods of reporting, and appraising. The collection department should strengthen its monitoring of pollution by the various units and carry out periodical or unscheduled chemical analyses. If an obvious change in pollution is discovered, the numerical data should be changed promptly.

6. The pollution charges should be collected either monthly or quarterly. The discharging unit should, on the basis of the pollution fee voucher issued by the collection department, pay a designated bank the pollution charge within 20 days. If the amount is not paid within that period of time, the charge is to increase at a rate of 0.1 percent per day. The late charge is to be calculated, written down, and collected by the bank when the unit pays the pollution charge.

7. All units and individuals that actively control and treat the "three wastes," develop comprehensive utilization, and protect the environment may be given honoraries and material awards.

All those who ignore environmental protection and commit one of the following acts, beside being charged pollution fees according to the regulation, will be assessed a fine and be held legally responsible.

(a) Those who pollute the environment by not implementing the "three-simultaneous efforts" and go ahead with production without approval;

(b) Those who seriously pollute the environment by accident or irregular discharge resulting from bad management;

(c) Those who continue to pollute after a date has been set to move or to stop production and refuse to comply with the order on time;

(d) Those who make fraudulent, and incomplete reports on the type, the quantity, and the monitored data of pollutant discharge.

If the fine is less than 5,000 yuan, the penalty is to be approved by the people's government of the county or district, or by the municipal environmental protection office; fines of more than 5,000 yuan are to be approved by the municipal people's government. The leaders in charge of the penalized unit and responsible persons are to pay 1 to 3 percent of the fine.

8. Problems concerning smoke and dust removal of all the units and residents operating tea stoves, fireplaces, dining hall stoves and the burning of bituminous coal in heating furnaces are to be handled according to the original regulation.

9. The pollution fees collected are to be included in the financial budget as supplement environmental protection funds and are to be managed as a special fund and are not to be included in the distribution system. The use of the fund is to be planned and arranged jointly by the environmental protection department and the financial department. The concrete method of use and distribution is to be based on related regulations.

10. The "Provisional Measures To Levy Pollution Charges in Lanzhou City" originally decreed by the municipal people's government ceases to be implemented; all other regulations which contravene the "Provisional Measures" decreed by the State Council and this notice are also abolished henceforth.

6248

CSO: 5000/4116

ENVIRONMENTAL PROTECTION CONFERENCE IN BEIJING REPORTED

Beijing HUANJING BAOHU /ENVIRONMENTAL PROTECTION/ in Chinese No 5, 1983 p 30

/Reported by Duan Min /3008 2404//

/Text/ The Beijing Municipality Environmental Protection Work Conference was held from 9 to 11 March. Vice mayor Lu Yu /7120 4416/ attended the conference and gave an important talk. More than 200 people participated in the conference, including leading comrades in charge of environmental protection work in the various departments and systems of the municipal government as well as persons responsible for environmental protection in the units concerned in the centrally administered organizations, the General Office Bureau of the State Council, and the People's Liberation Army.

The conference relayed recent directives of the central leading comrades regarding environmental protection work as well as the spirit of the national forum on environmental protection work held at the end of last year. Participants at the conference seriously discussed the plan (draft) for environmental protection in Beijing Municipality within the last 3 years of the Sixth 5-Year Plan period. The conference made clear that the aim of environmental protection work was to realize socialist modernization and the key task was to create the basic conditions for the development of economic construction, and to serve the realization of quadrupling the gross industrial and agricultural output.

The conference pointed out that although environmental protection work in Beijing had achieved some definite results, environmental conditions in the capital were still far from what the Party Central Committee and the State Council demanded, and that pollution has not yet been truly controlled. Therefore, we must use the spirit of the 12th Party Congress and the Secretariat's four directives on the policy for the construction of the capital as the basic guiding ideology, the protection of the city environment and the prevention and control of urban and industrial pollution as the focal point, and strengthen the protection of the agroecological environment and implement prevention as the key, as well as adopt the policy of integrating prevention with comprehensive control and management and adhere to the principle of "whoever pollutes must treat pollution." We must strengthen environmental management, use management to speed up control, combine industrial readjustment with technological transformation to carry out the comprehensive utilization of the "three wastes," reduce the consumption of resources and energy, and integrate economic, social and environmental benefits to improve the capital's appearance as quickly as possible.

The conference emphatically pointed out that during the present organizational reforms, environmental protection work must be strengthened, not weakened. The conference requested that every department and unit, based on the spirit of the Party Central's directive on reform work, and through reform, build an environmental protection contingent that is capable, has a good grasp of the Party's policies, and is proficient in professional work and technology. The conference also requested that every unit should seriously follow through and implement the spirit and the specific demands of the conference, and work together to create a new situation in the environmental protection work of the capital.

12380

CSO: 5000/4177

BRIEFS

HEILONGJIANG POLLUTION MONITORING VESSEL--Harbin, 11 Jun (XINHUA)--A water pollution monitoring vessels was put into operation recently along the Songhua River in Heilongjiang Province, adding the number of such vessels to six. The 26.5-meter-long, 6-meter-wide vessel inspects water along a 75-kilometer section of the river that runs through Harbin, capital of Heilongjiang Province. More than 700 kilometers of the 1,840-kilometer long Songhua River snakes through Heilongjiang Province, which is a major Chinese heavy industry center. Water is getting cleaner and more fish have appeared in the once heavily polluted Songhua River, thanks to pollution-control efforts. In 1978, according to earlier reports, the Songhua River system encompassing Heilongjiang and Jilin Provinces was listed as one of the key areas for special control efforts. A total of 140 factories along the river have been ordered to stop discharging waste into the river within specific periods. Meanwhile, scores of factories were closed down, merged with other factories or shifted to other products or moved to other places. [Text] [Beijing XINHUA in English 0748 GMT 11 Jun 83 OW]

SHENYANG POLLUTION CONTROL--Shenyang, 10 Jun (XINHUA)--Antipollution projects, designed to control industrial waste in major plants and boilers and kilns in the heavy industrial city of Shenyang, are under way, according to Vice Mayor Zhang Rongmao. At a recent environmental protection meeting, the vice mayor said that the city has earmarked 5.5 million yuan for 51 antipollution projects this year, including facilities to reduce smoke of boilers along major streets and to recycle industrial waste. Shenyang has a population of 2.7 million. At present, 59 plants--metallurgical, chemical, electroplating and other factories--are considered major polluters. Last year, the vice mayor reported, the city invested 6.55 million yuan to complete 25 pollution-control projects. Projects completed in 15 large pharmaceutical, nonferrous metal processing, and other factories have enabled them to recover more than 2,000 tons of material and treat 3.8 million tons of waste water a year. In 1982, sulphur dioxide, soot, heavy metals and 23 other kinds of contaminants discharged by 35 plants were reduced by 43 percent compared with 1978, according to a municipal survey. The major contaminants in waste water, including phenol, chlorine, chromium, and cadmium, were 54 percent lower. The first-stage projects for an automatic continuous environmental monitoring system, including a central monitoring station and five sub-stations, are scheduled to be completed by the end of this year. [Beijing XINHUA in English 0751 GMT 10 Jun 83 OW]

HUNAN ANTIPOLLUTION EFFORTS--Changsha, 7 Jul (XINHUA)--Central China's Hunan Province has made headway in preventing pollution in newly built major and medium-sized industrial projects, the Provincial Environmental Protection Department reported. According to the department, antipollution facilities are now functioning in 18 of the 19 major and medium-sized projects built since 1979, when China's first environmental protection law was enforced on a trial basis. The other one, a manganese mine, will soon complete its pollution-control facilities. Most of such facilities were designed, built and put into operation simultaneously with the production facilities. The 19 projects cover steam power, metallurgical, chemical, textile and other industries. Their pollution-preventing facilities can annually treat 9.8 million tons of waste water, 7.9 billion cubic meters of waste gas, and 270,000[^] tons of coal cinder and slag. The Provincial Environmental Protection Department exercises supervision over the construction projects and sees to the implementation of laws and regulations on environmental protection. [Excerpts] [Beijing XINHUA in English 1341 GMT 7 Jul 83 OW]

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